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**Ciuca et al.**

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(54) **VIDEO PLAYBACK IN AN ONLINE STREAMING ENVIRONMENT**

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**Related U.S. Application Data**

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(51) **Int. Cl.**

| | |
|---|---|
| ***H04N 21/472*** | (2011.01) |
| ***H04N 21/431*** | (2011.01) |
| ***H04N 21/435*** | (2011.01) |
| ***H04N 21/44*** | (2011.01) |

(Continued)

(52) **U.S. Cl.**
CPC ..... ***H04N 21/47217*** (2013.01); ***H04N 21/431*** (2013.01); ***H04N 21/435*** (2013.01); ***H04N 21/44*** (2013.01); ***H04N 21/47202*** (2013.01); ***H04N 21/4821*** (2013.01); ***H04N 21/4852*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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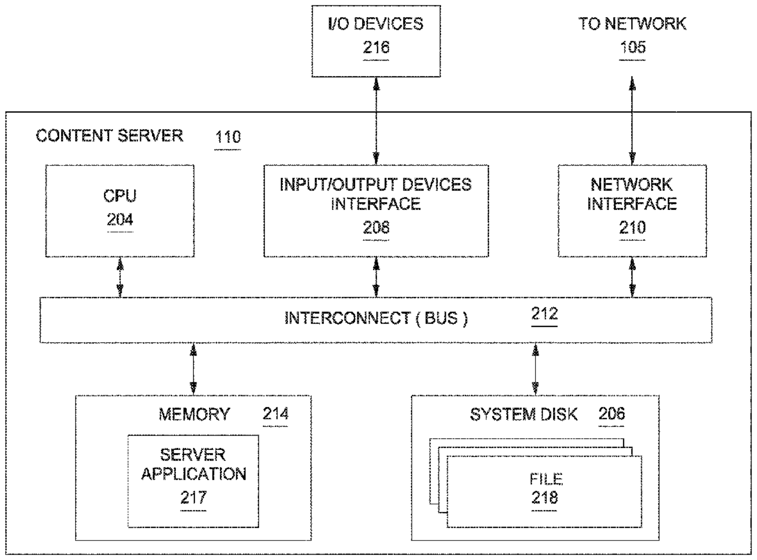
(57) **ABSTRACT**

A computer-implemented method of displaying video content includes, based on an input to transition playback of a video content item from a first media player that is instantiated in a user interface to a second media player that is instantiated in the user interface, determining a current value of a first state descriptor associated with the first media player; setting a value of a second state descriptor associated with the second media player to match the current value of the first state descriptor; and after setting the value of the second state descriptor, causing the second media player to begin playback of the video content item, wherein the second media player begins playing the video content item based on the value of the second state descriptor.

**19 Claims, 16 Drawing Sheets**



(51) **Int. Cl.**

| | |
|---|---|
| ***H04N 21/485*** | (2011.01) |
| ***H04N 21/482*** | (2011.01) |

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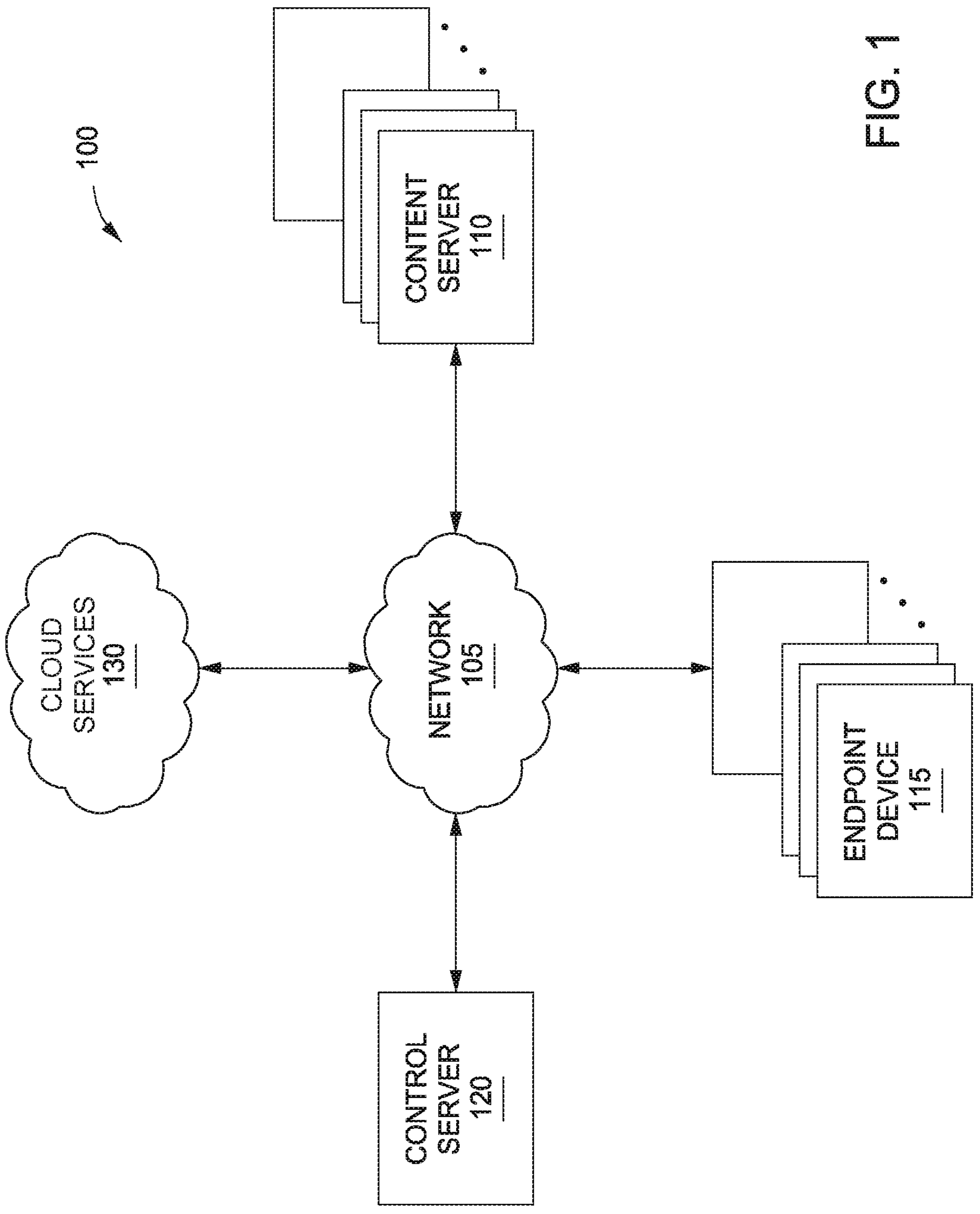

100
CONTENT SERVER 110
CLOUD SERVICES 130
NETWORK 105
ENDPOINT DEVICE 115
CONTROL SERVER 120

FIG. 1

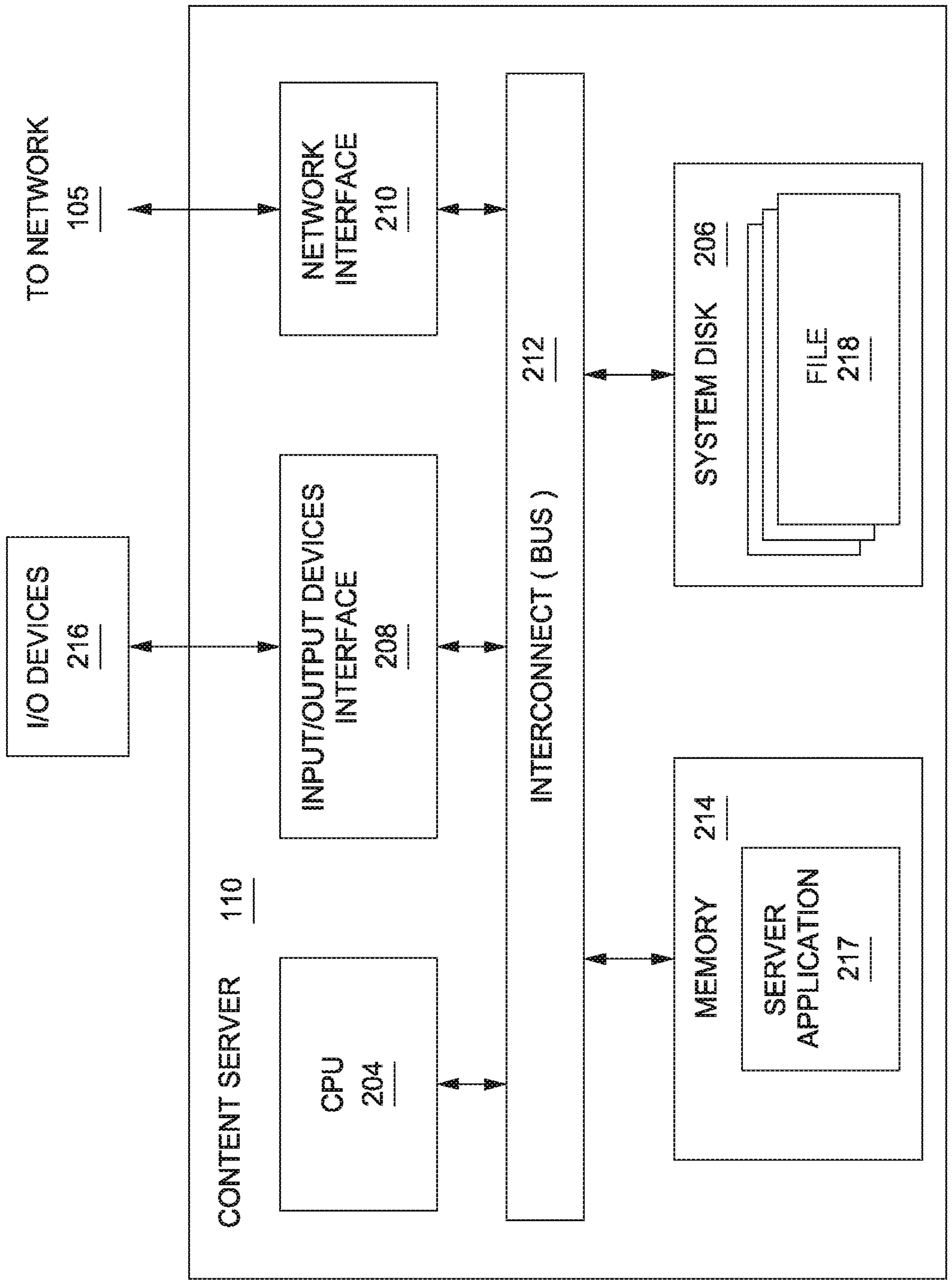

TO NETWORK 105
I/O DEVICES 216
CONTENT SERVER 110
CPU 204
INPUT/OUTPUT DEVICES INTERFACE 208
NETWORK INTERFACE 210
INTERCONNECT ( BUS ) 212
MEMORY 214
SERVER APPLICATION 217
SYSTEM DISK 206
FILE 218

FIG. 2

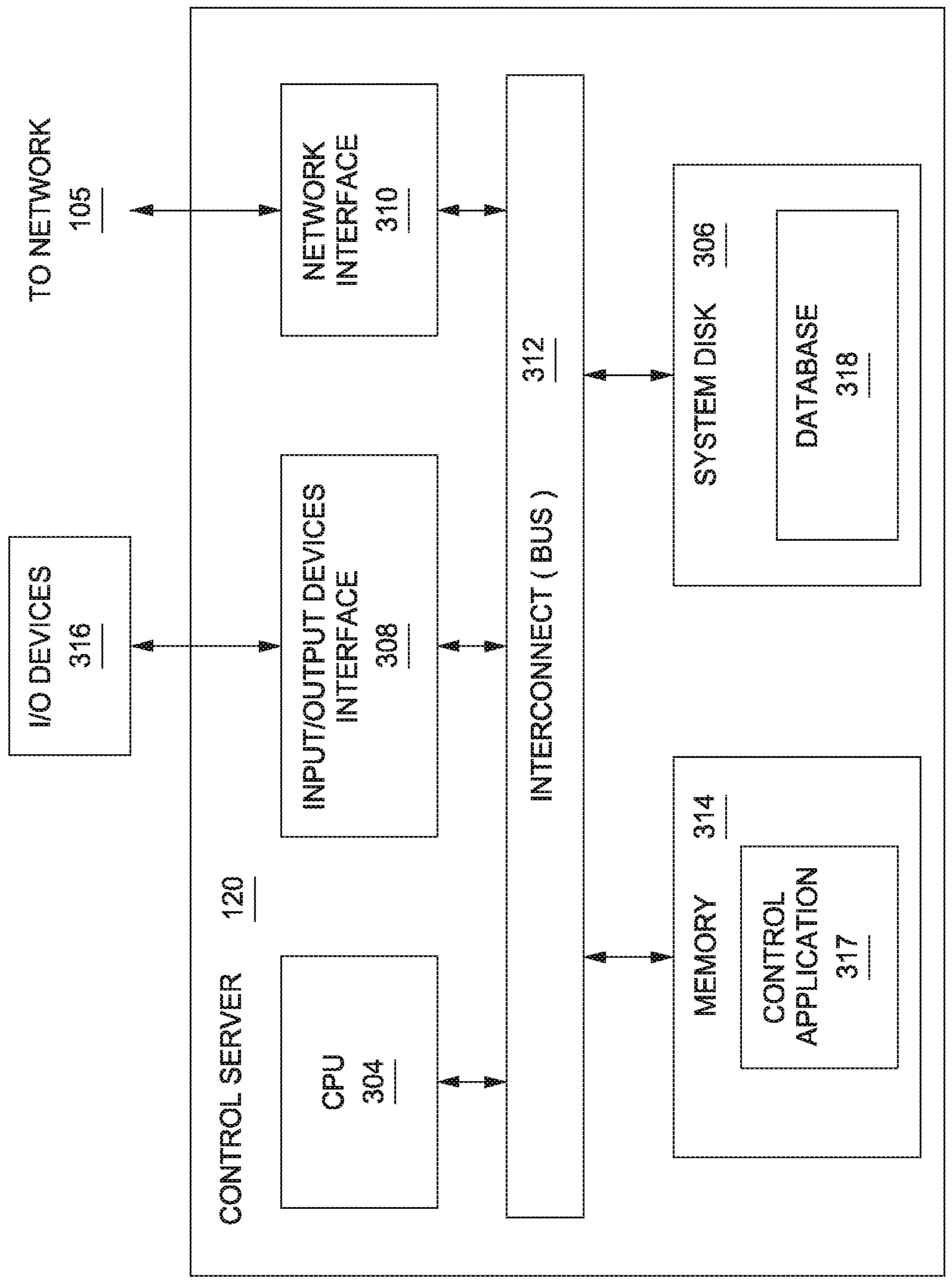

TO NETWORK
105
I/O DEVICES
316
CONTROL SERVER
120
CPU
304
INPUT/OUTPUT DEVICES INTERFACE
308
NETWORK INTERFACE
310
INTERCONNECT ( BUS )
312
MEMORY
314
CONTROL APPLICATION
317
SYSTEM DISK
306
DATABASE
318

FIG. 3

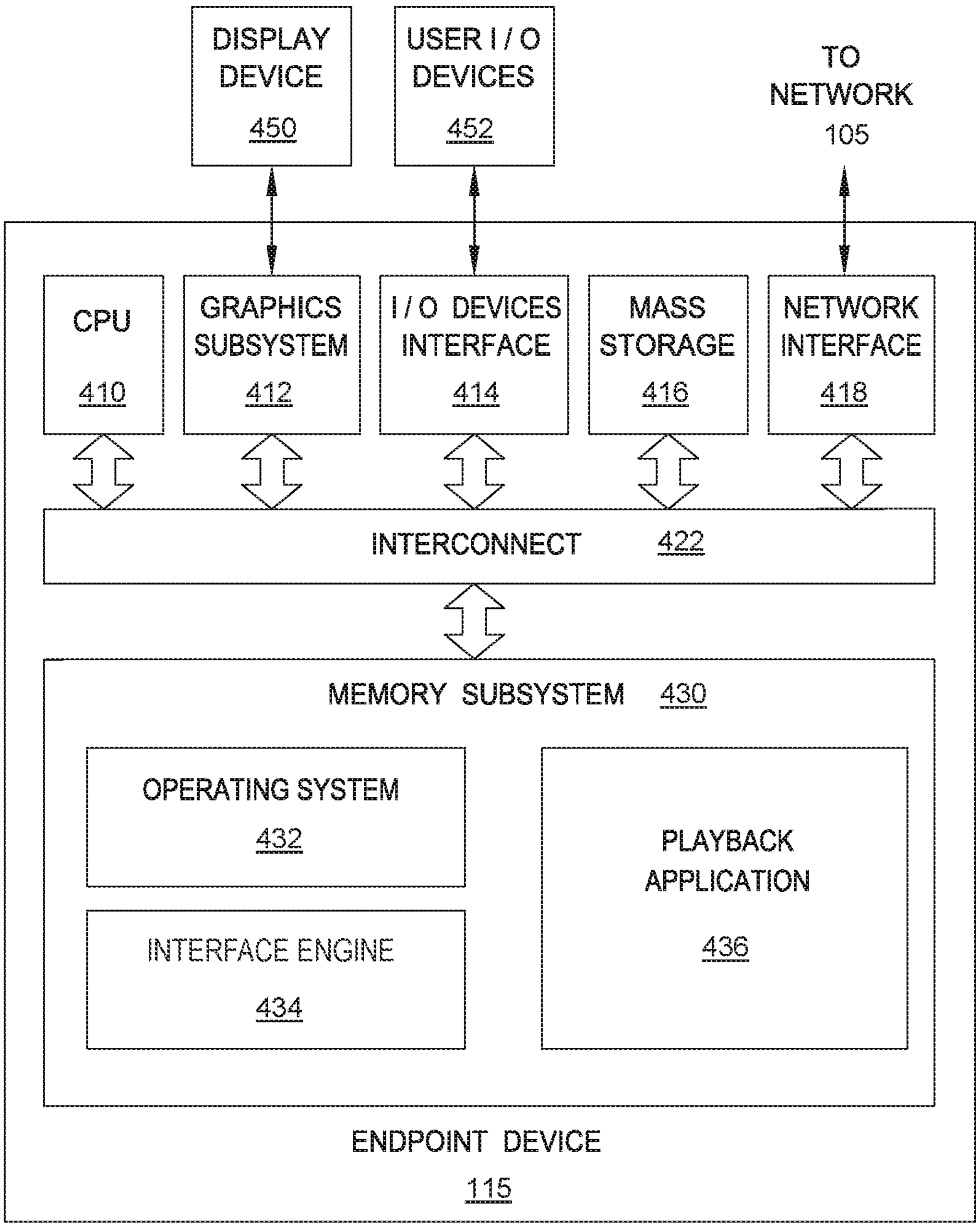

DISPLAY DEVICE
450
USER I / O DEVICES
452
TO NETWORK
105
CPU
410
GRAPHICS SUBSYSTEM
412
I / O DEVICES INTERFACE
414
MASS STORAGE
416
NETWORK INTERFACE
418
INTERCONNECT
422
MEMORY SUBSYSTEM
430
OPERATING SYSTEM
432
INTERFACE ENGINE
434
PLAYBACK APPLICATION
436
ENDPOINT DEVICE
115

FIG. 4

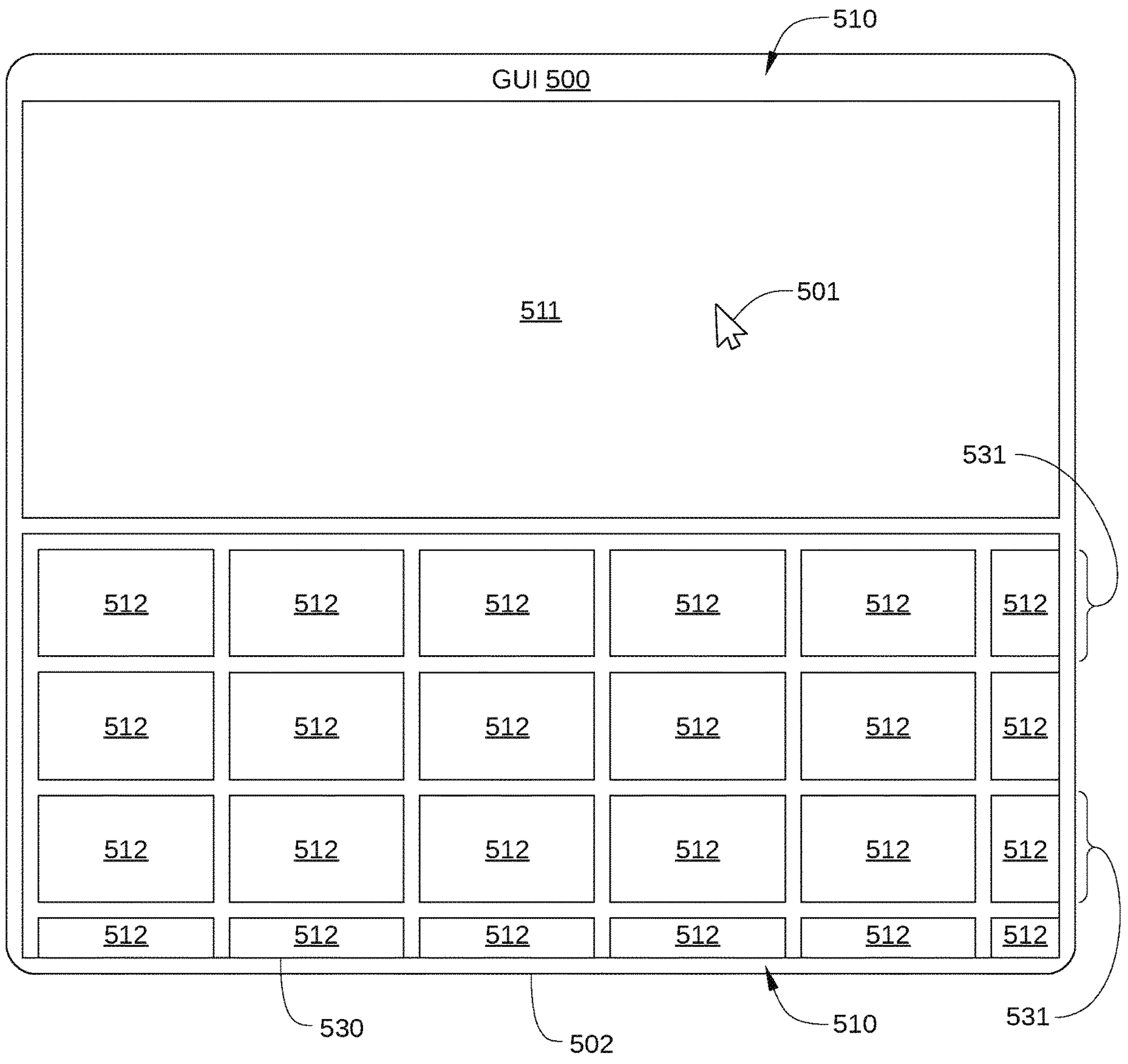


FIG. 5

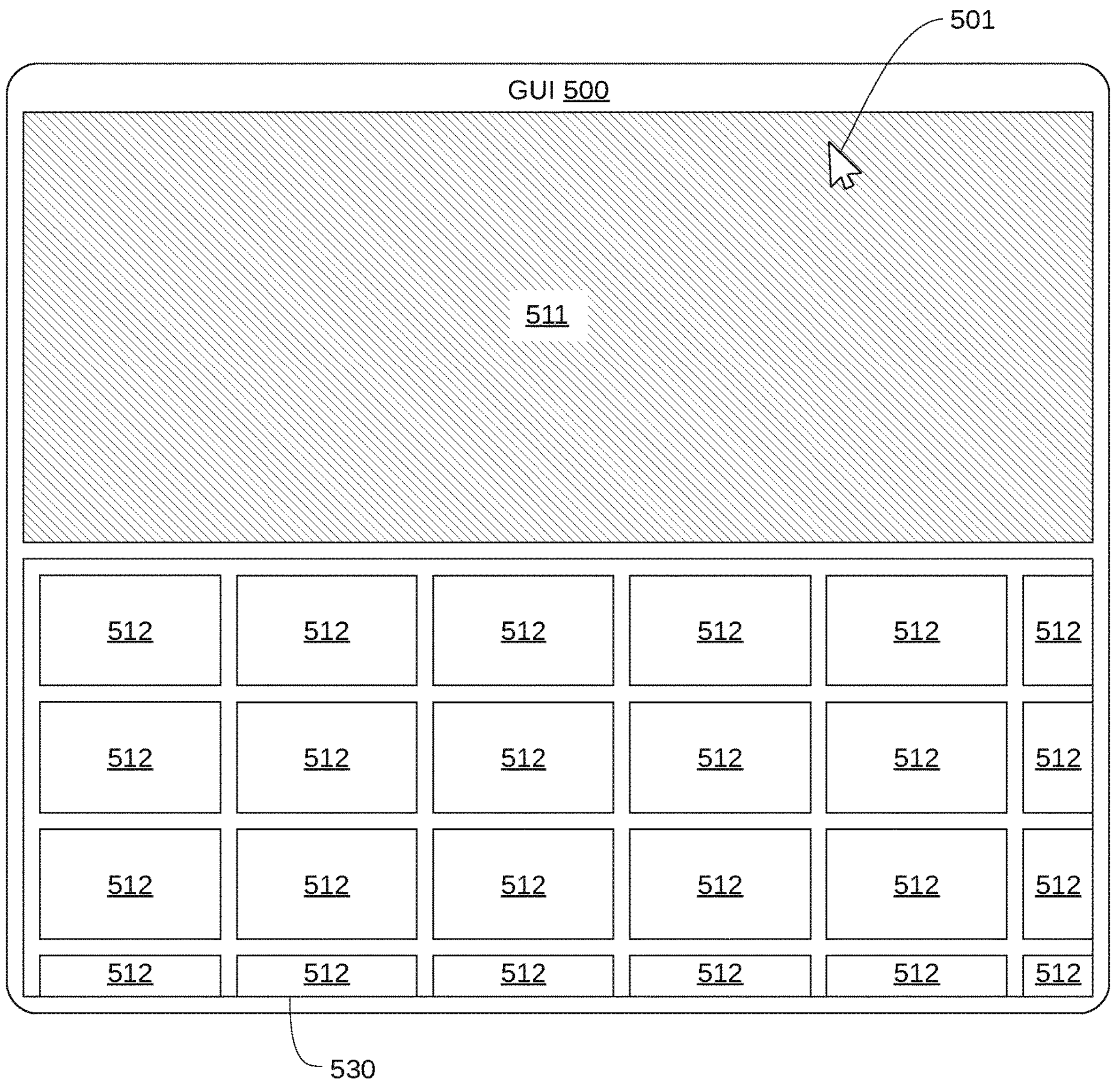


FIG. 6A

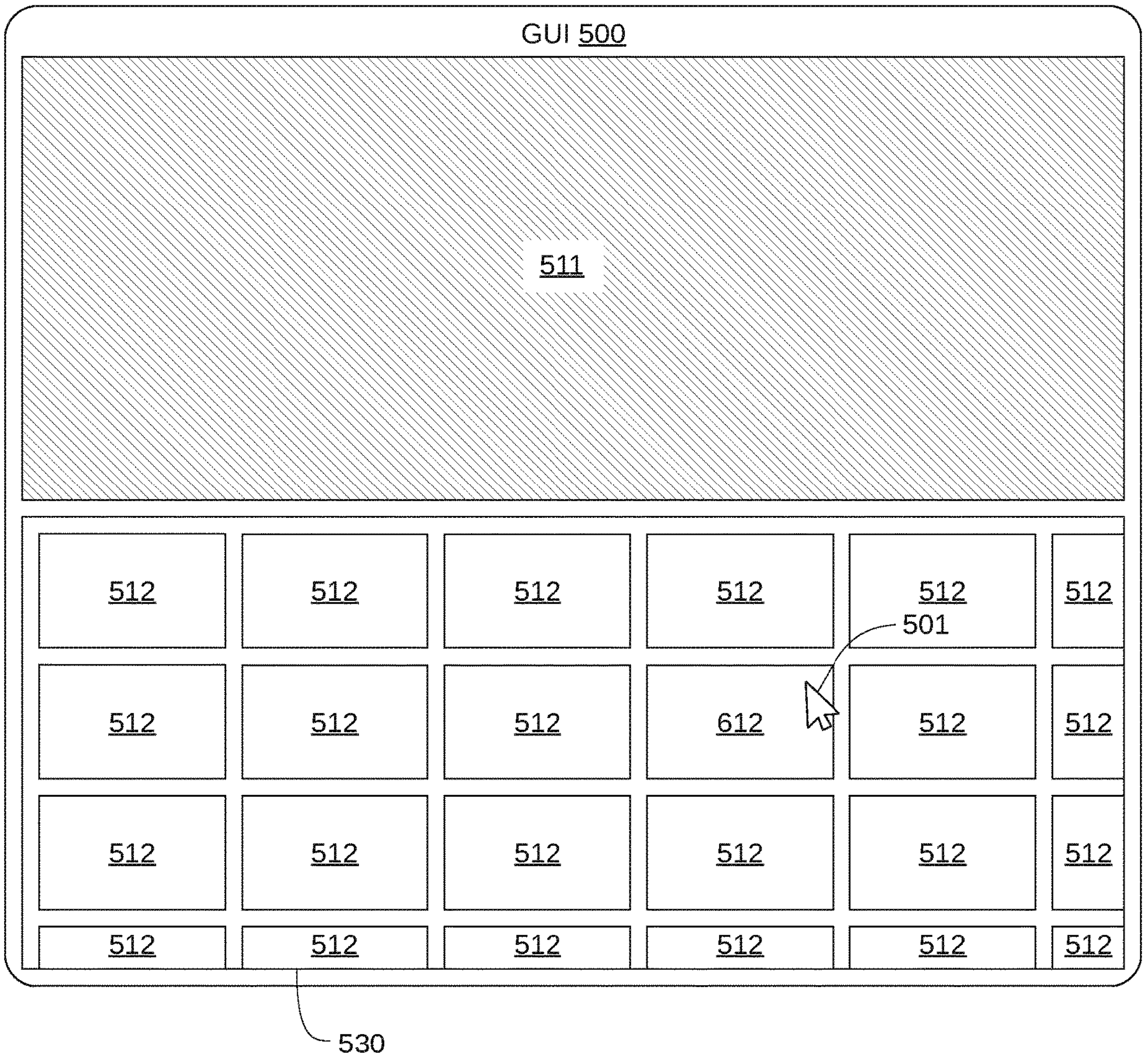


FIG. 6B

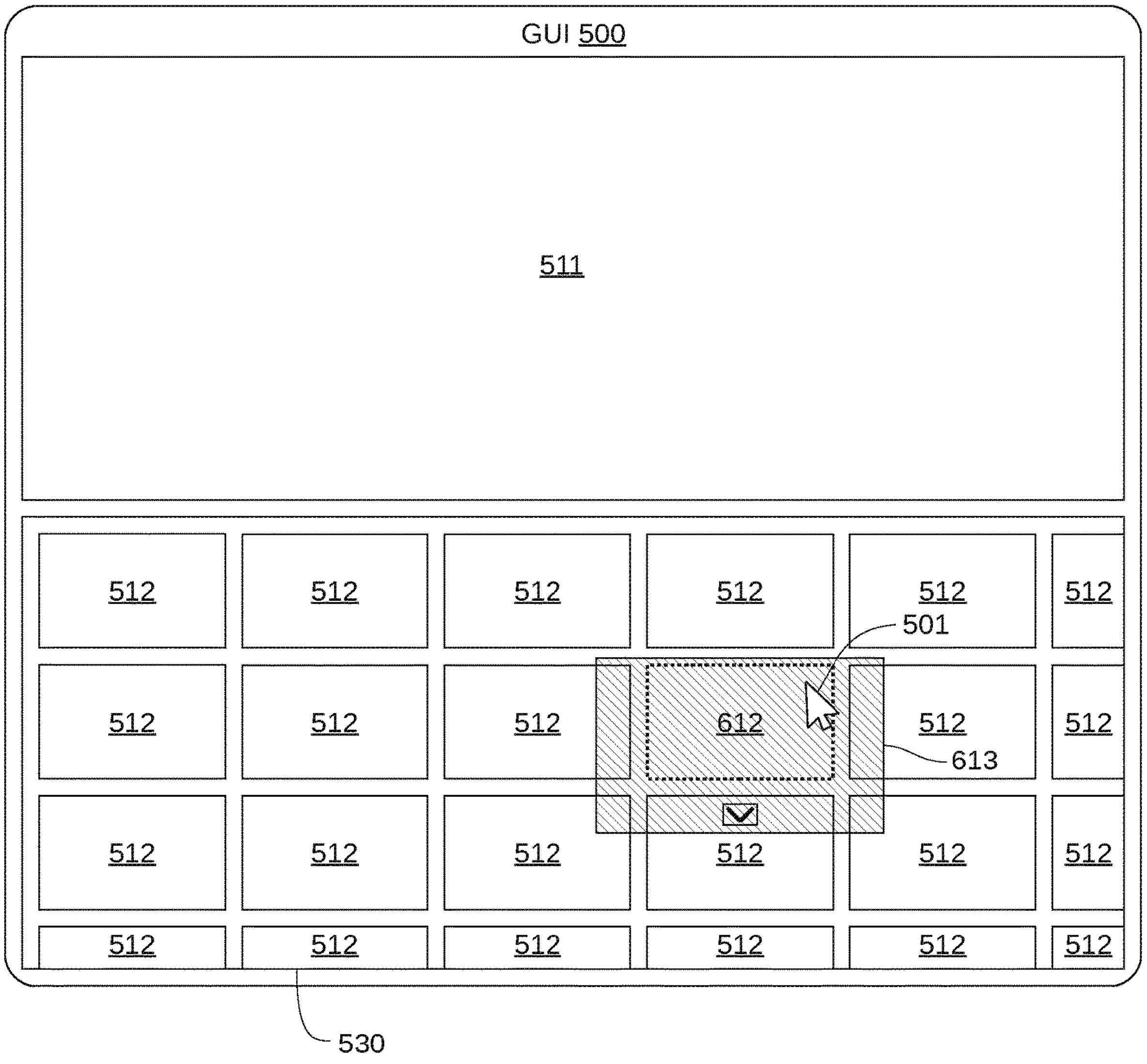


FIG. 6C

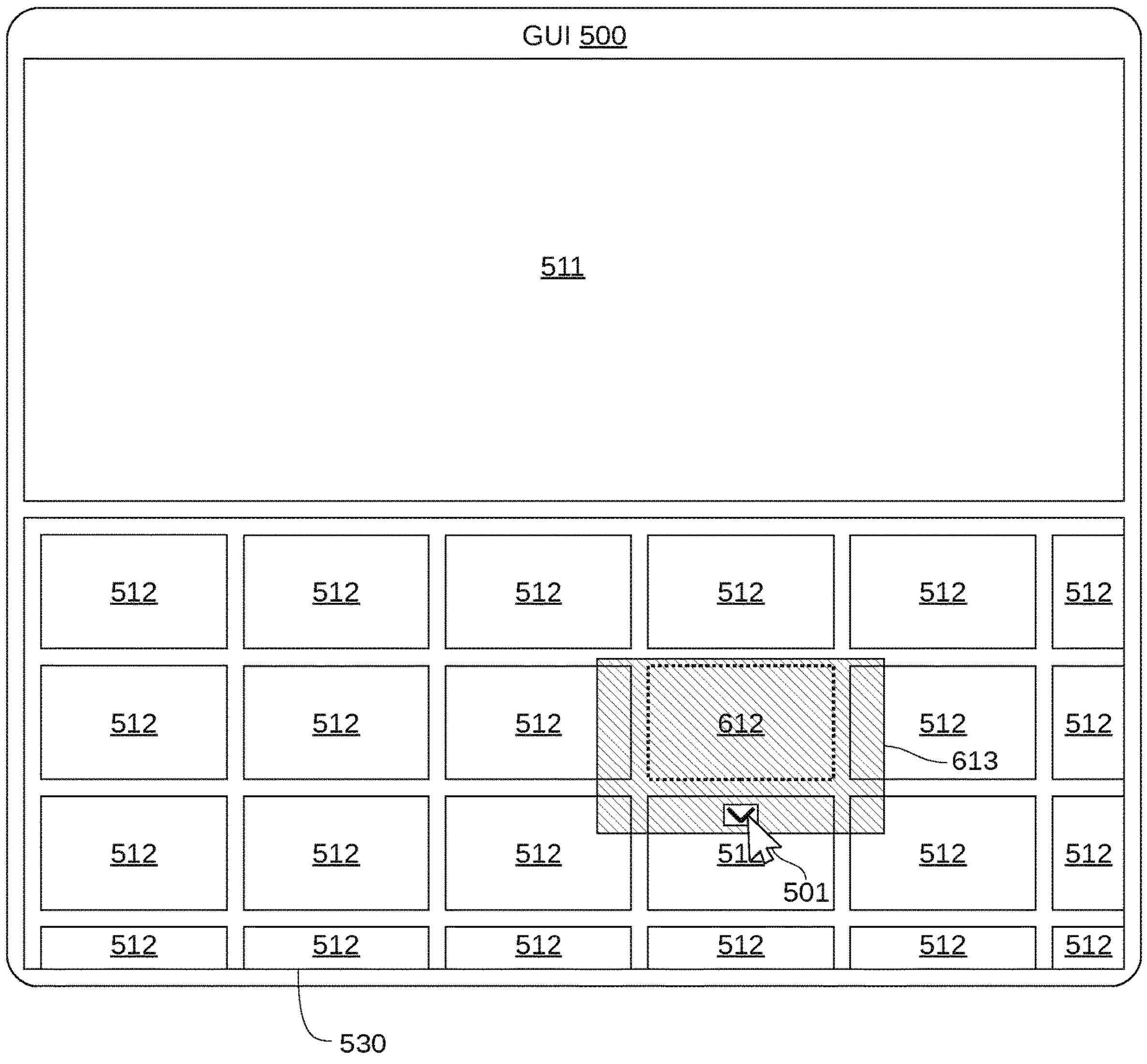


FIG. 6D

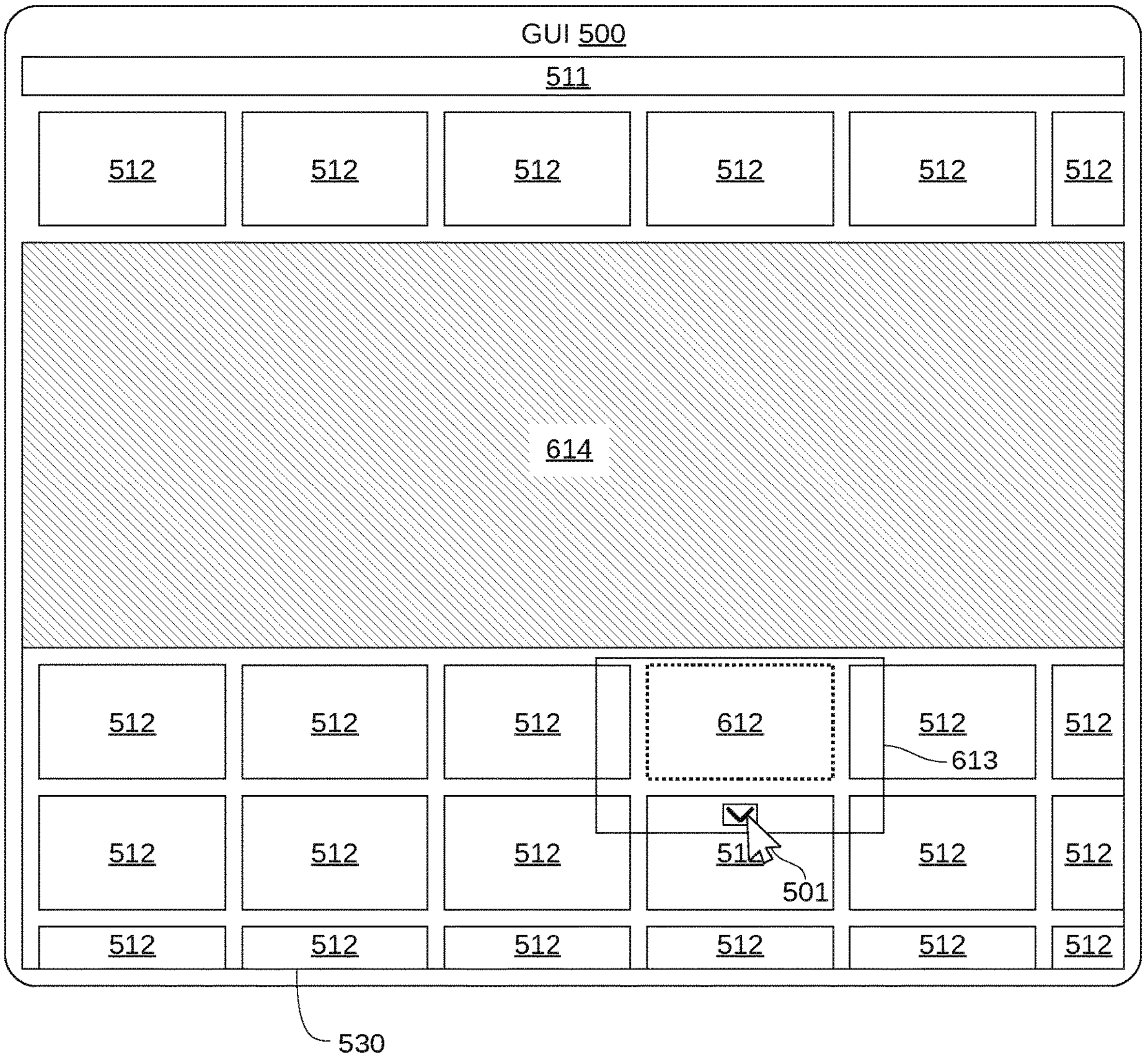


FIG. 6E

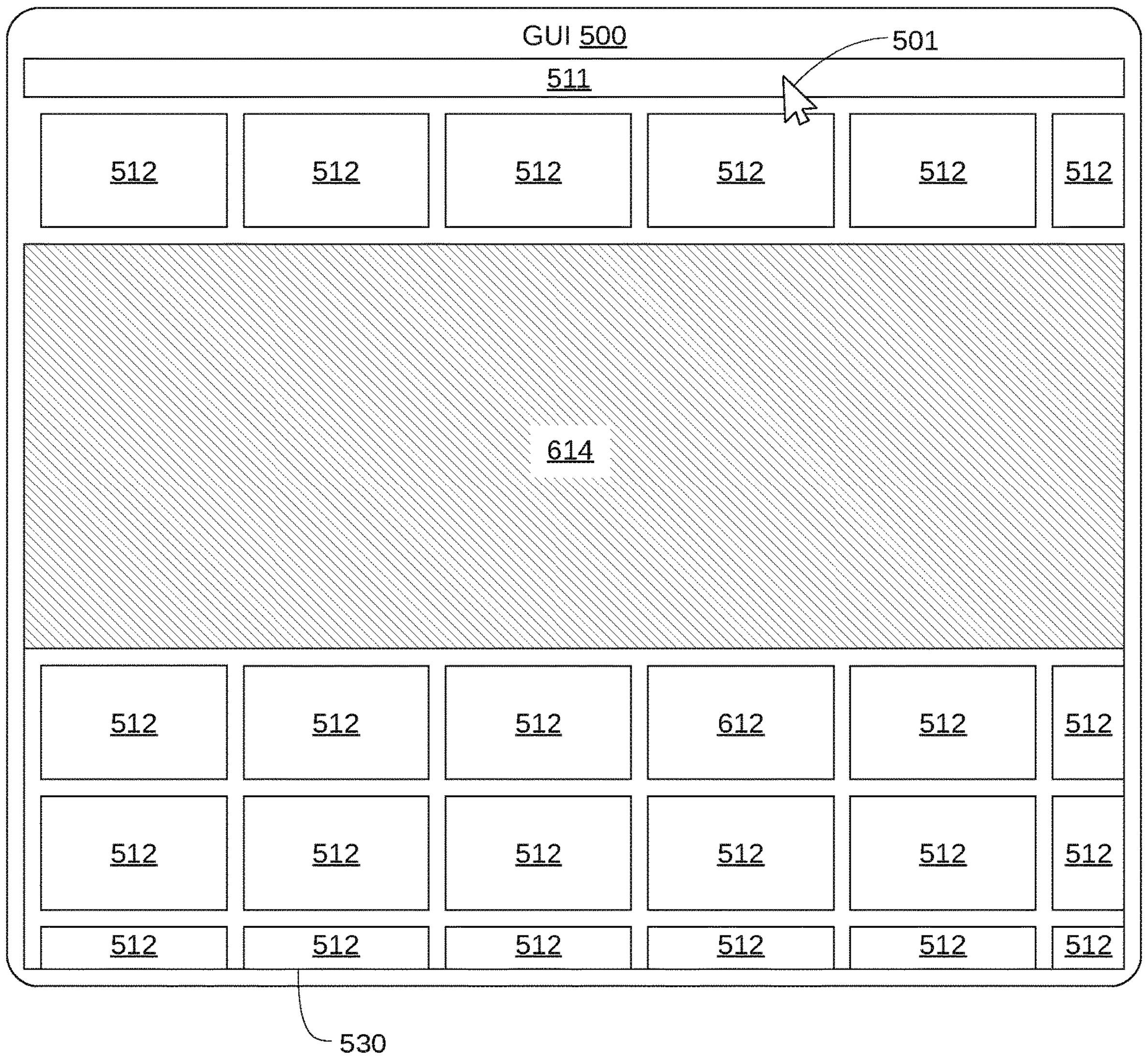
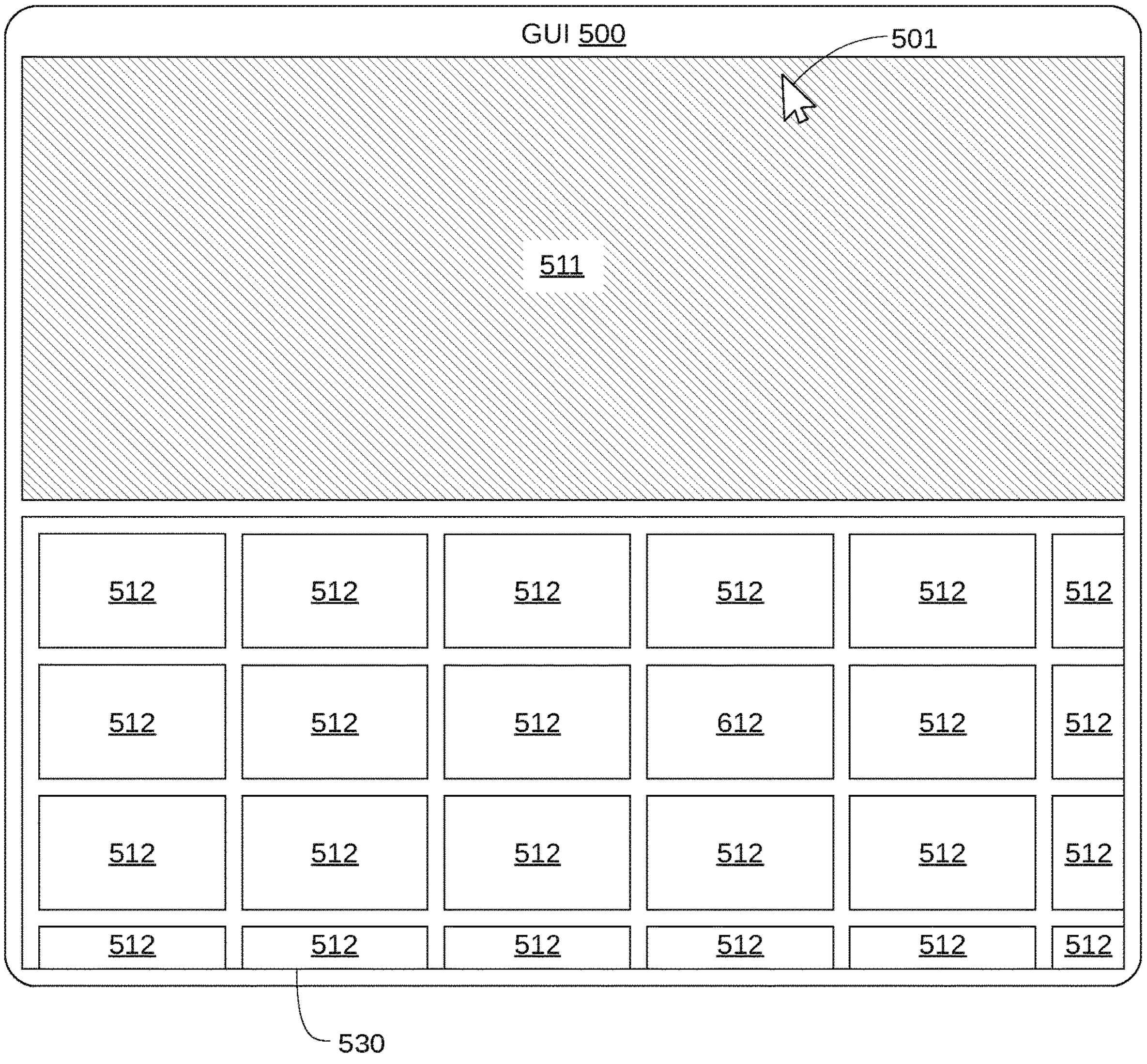

GUI 500
501
511
512
512
512
512
512
512
614
512
512
512
612
512
512
512
512
512
512
512
512
512
512
512
512
512
512
530

FIG. 6F


GUI 500
501
511
512
512
512
512
512
512
512
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512
612
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512
512
512
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512
512
512
530

FIG. 6G

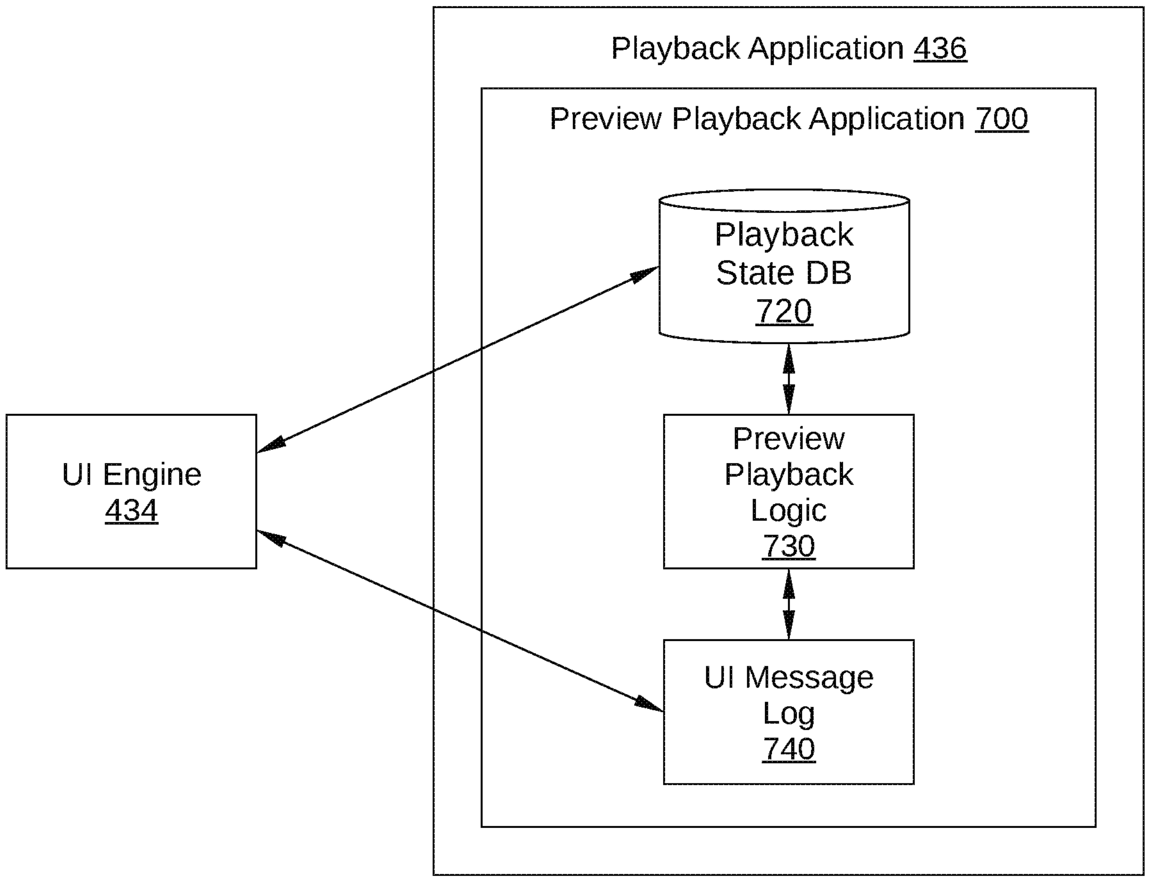
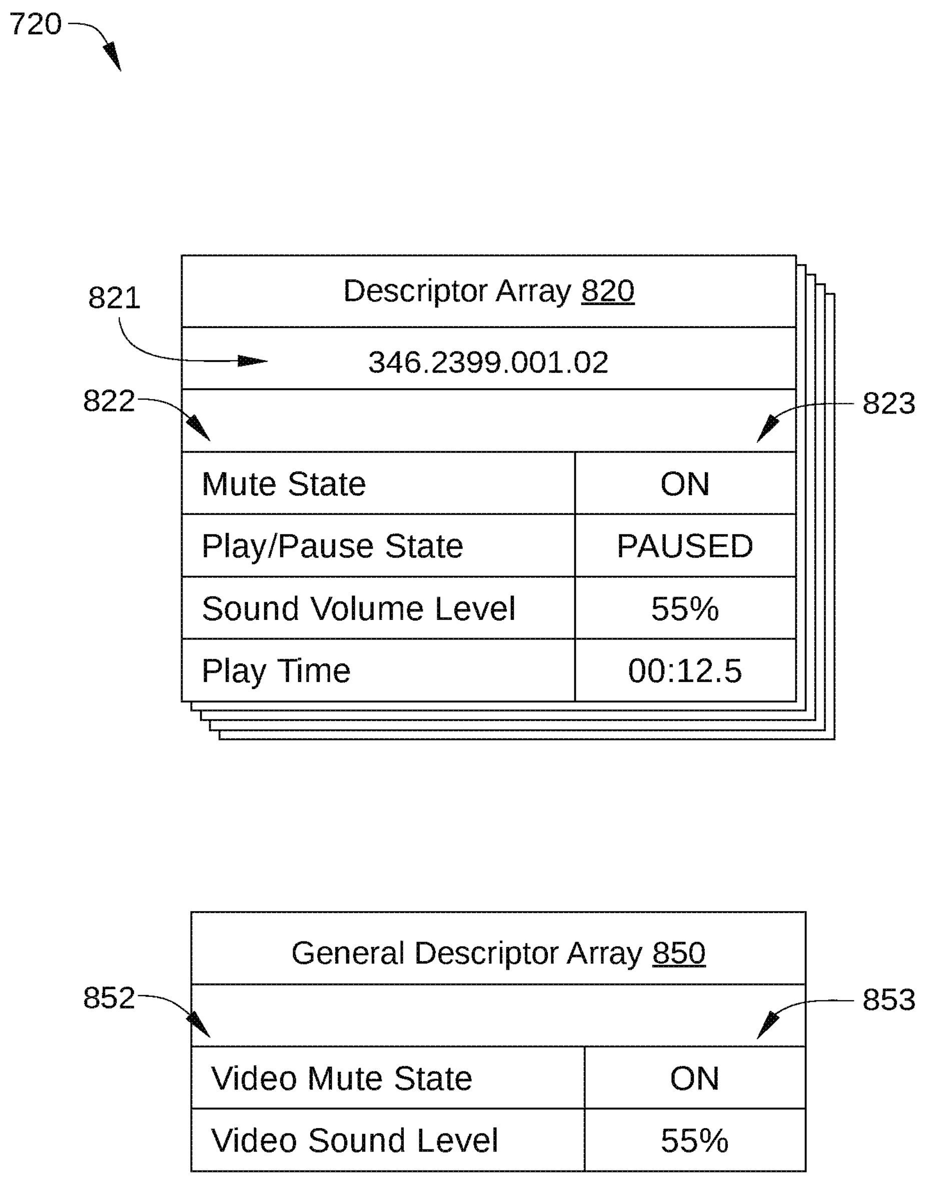

Playback Application 436
Preview Playback Application 700
Playback State DB 720
Preview Playback Logic 730
UI Message Log 740
UI Engine 434

FIG. 7



| Descriptor Array 820 | |
|---|---|
| 346.2399.001.02 | |
| | |
| Mute State | ON |
| Play/Pause State | PAUSED |
| Sound Volume Level | 55% |
| Play Time | 00:12.5 |

| General Descriptor Array 850 | |
|---|---|
| | |
| Video Mute State | ON |
| Video Sound Level | 55% |

FIG. 8

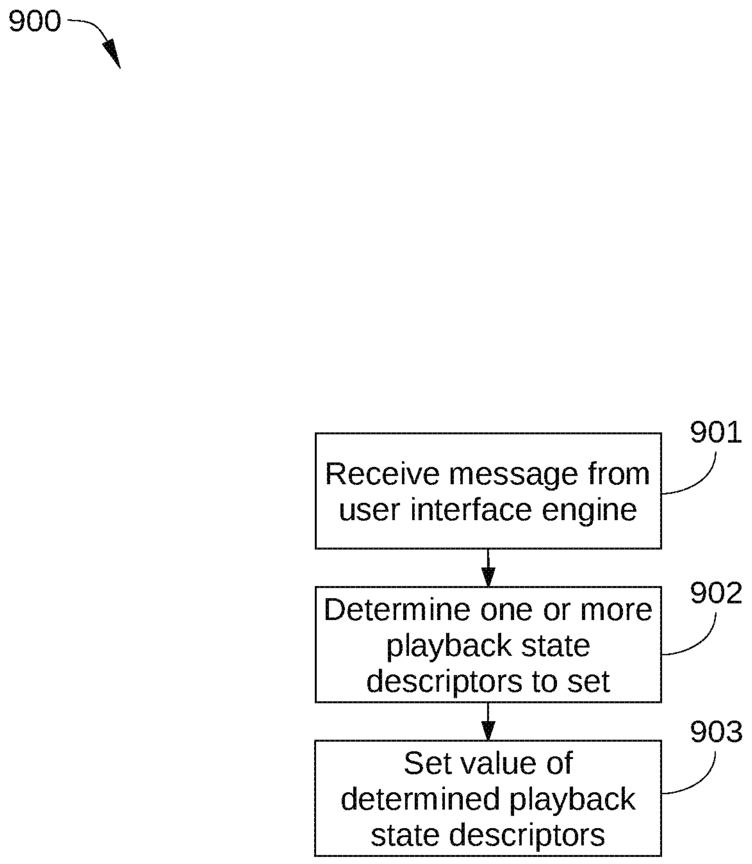

900
Receive message from user interface engine
901
Determine one or more playback state descriptors to set
902
Set value of determined playback state descriptors
903

FIG. 9

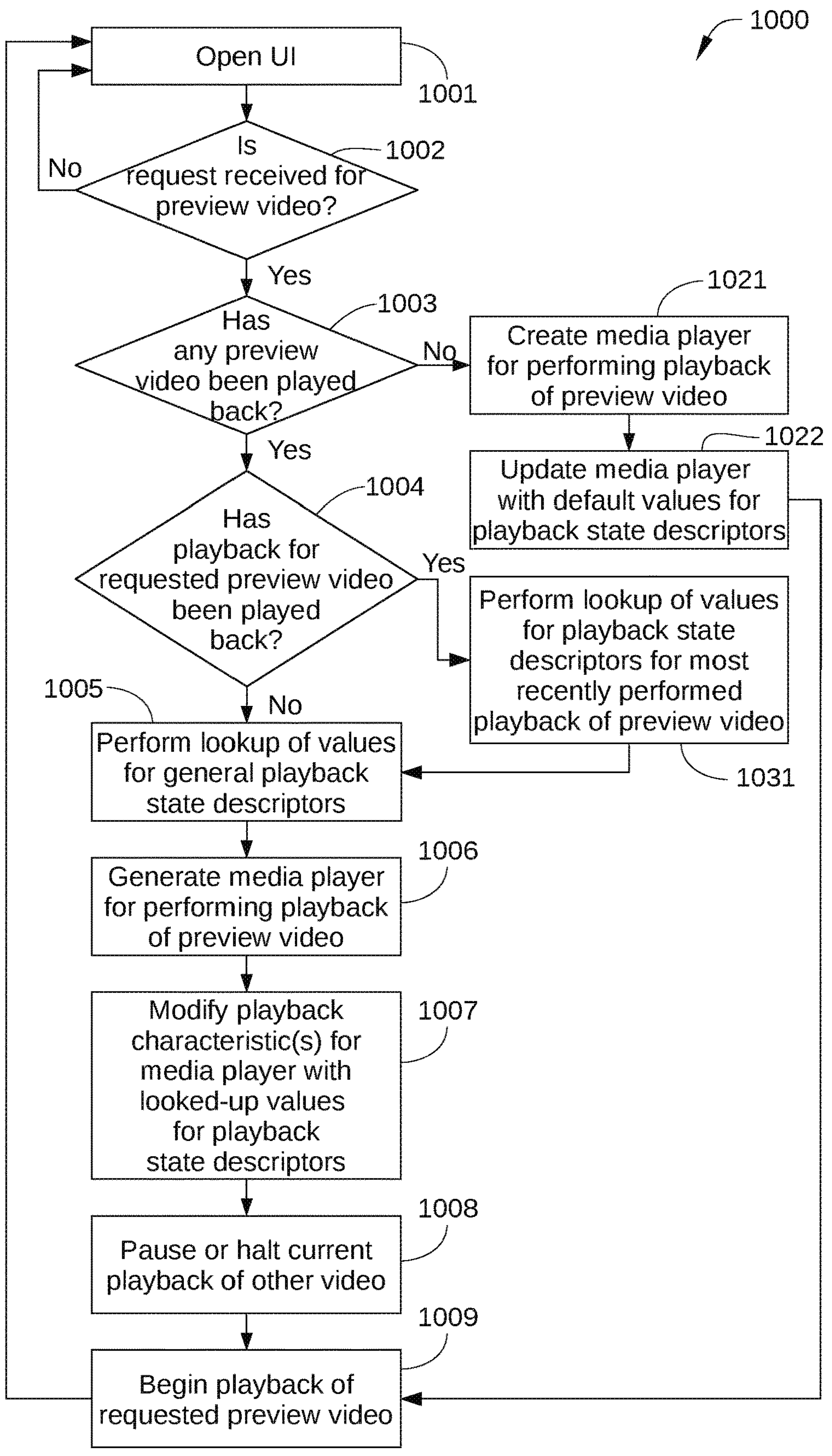

1000
Open UI
1001
Is request received for preview video?
1002
No
Yes
Has any preview video been played back?
1003
No
Create media player for performing playback of preview video
1021
Update media player with default values for playback state descriptors
1022
Yes
Has playback for requested preview video been played back?
1004
Yes
Perform lookup of values for playback state descriptors for most recently performed playback of preview video
1031
No
Perform lookup of values for general playback state descriptors
1005
Generate media player for performing playback of preview video
1006
Modify playback characteristic(s) for media player with looked-up values for playback state descriptors
1007
Pause or halt current playback of other video
1008
Begin playback of requested preview video
1009

FIG. 10

# VIDEO PLAYBACK IN AN ONLINE STREAMING ENVIRONMENT

## CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority benefit of the U.S. Provisional Patent Application titled, "CONTENT PREVIEW INTERFACE," filed on Nov. 2, 2018 and having Ser. No. 62/755,326. The subject matter of this related application is hereby incorporated herein by reference.

## BACKGROUND

### Field of the Various Embodiments

The present disclosure relates generally to playing streaming video and, more specifically, to video playback in an online streaming environment.

### Description of the Related Art

With on-demand video streaming becoming one of the most popular forms of media consumption, the number of titles available to the on-demand viewer has been increased dramatically. However, despite the wide variety of titles now available, on-demand viewers frequently have difficulty locating content that they find interesting. For example, by simply scanning a list of a possible video titles to view, the on-demand viewer is unlikely to make a satisfactory selection; even if the list of titles is sorted by genre, selection of a particular title in this way is little more than a random process unless the subject matter of that particular title is already known to the on-demand viewer. Similarly, reading a plot summary for each title option being considered is an ineffective way for the on-demand viewer to locate content of interest; searching for a suitable video title in this way is very time-consuming and generally requires the user to put significant effort into researching each and every title that sounds at all interesting.

In light of the above, video streaming services currently facilitate the selection process for a prospective on-demand viewer by presenting to the viewer a static representative image for each available title. Each static image serves the same function for the associated title as the cover art of a book, video tape, or digital versatile disk (DVD), promoting the title while visually providing some insight into the subject matter of the title. For example, a static image can quickly convey one or more of the genre, subject matter, starring actors, or other attributes of a title. Additional textual information, such as a summary sentence or a tag line, may also be included in the static image. Generally, a plurality of such static images is presented in an array, so that the on-demand viewer can visually browse through a large number of possible video titles quickly.

One drawback of relying on an array of such images for enabling video selection is that a static, box-art-like image cannot convey much detailed information about a particular video title. As a result, a prospective viewer is less likely to be drawn in by such a selection process and select a video title. By contrast, trailer and other summary videos are well-known to give significant insight into the subject matter of a video title in a short time. Consequently, summary videos are more likely to successfully gain the interest of the prospective viewer and influence the viewer to select the video title associated with the trailer. However, summary videos are data-intensive, and downloading of such videos

can overload or slow the streaming connection employed by the prospective viewer. In addition, the various user interactions that are enabled by streaming video to a computer can further complicate the streaming process. For example, requesting preview videos for multiple available titles can overload the download process and impact other processes running in parallel on the computer.

As the foregoing illustrates, what is needed in the art are systems and methods for more effectively displaying video previews.

## SUMMARY

A method of displaying video content includes, based on an input to transition playback of a video content item from a first media player that is instantiated in a user interface to a second media player that is instantiated in the user interface, determining a current value of a first state descriptor associated with the first media player; setting a value of a second state descriptor associated with the second media player to match the current value of the first state descriptor; and after setting the value of the second state descriptor, causing the second media player to begin playback of the video content item, wherein the second media player begins playing the video content item based on the value of the second state descriptor.

At least one technological improvement of the disclosed embodiments is that coordination of video playback is enabled between multiple UI components that can each perform video playback simultaneously. Consequently, downloading multiple video data streams when transitioning video playback from one UI component to another UI component can be avoided. In addition, multiple UI components are prevented from simultaneously performing playback of video content.

## BRIEF DESCRIPTION OF THE DRAWINGS

So that the manner in which the above recited features of the various embodiments can be understood in detail, a more particular description of the inventive concepts, briefly summarized above, may be had by reference to various embodiments, some of which are illustrated in the appended drawings. It is to be noted, however, that the appended drawings illustrate only typical embodiments of the inventive concepts and are therefore not to be considered limiting of scope in any way, and that there are other equally effective embodiments.

FIG. **1** illustrates a network infrastructure, according to various embodiments;

FIG. **2** is a more detailed illustration of the content server of FIG. **1**, according to various embodiments;

FIG. **3** is a more detailed illustration of the control server of FIG. **1**, according to various embodiments;

FIG. **4** is a more detailed illustration of the endpoint device of FIG. **1**, according to various embodiments;

FIG. **5** illustrates a graphical user interface (GUI) generated by the interface engine of FIG. **4**, according to various embodiments;

FIGS. **6A**-**6G** illustrate the GUI of FIG. **5** at various points in a process of displaying preview videos of available content items, according to various embodiments;

FIG. **7** is a block diagram of preview playback application, configured to perform various embodiments;

FIG. **8** is a schematic illustration of the playback state database of FIG. **7**, according to an embodiment;

FIG. **9** sets forth a flowchart of method steps for updating a playback state database, according to various embodiments; and

FIG. **10** sets forth a flowchart of method steps for transitioning playback of video content from a first user interface component to a second user interface component, according to various embodiments.

## DETAILED DESCRIPTION

In the following description, numerous specific details are set forth to provide a more thorough understanding of the various embodiments. However, it will be apparent to one of skilled in the art that the inventive concepts may be practiced without one or more of these specific details.

### Overview

Trailer videos and other summary videos give insight into the subject matter of a video title in a short time. Thus, summary videos are more likely to successfully gain the interest of the prospective viewer and influence the viewer to select the video title associated with the trailer. However, summary videos are data-intensive, and downloading of such videos can overload or slow the streaming connection employed by the prospective viewer. Further, the media players integrated into a user interface for streaming videos generally operate independently from each other, where each media player is unaware of the playback state of other media players associated with the user interface. Consequently, coordination between such media players can be problematic; a user requesting a video preview for multiple video titles can result in multiple videos being played concurrently. In addition, when playback of a preview video transitions from a first media player to a second media player (for example, from a lower resolution media player to a higher resolution media player), the second media player begins playing the preview video from the beginning, which can be frustrating to the user. The disclosed techniques enable a smooth transition between the playback of a preview video in one media player implemented in a streaming video user interface and another media player implemented in the user interface. As a result, a user is more likely to be drawn in by such a selection process and select a video title.

In various embodiments, playback state descriptors are employed to track certain attributes of each user interface (UI) component (such as a media player) instantiated in a user interface. These attributes include the current play time of a video being played by the UI component, a sound volume level for a video being played by the UI component, a mute state of the UI component, and the like. The current values of such playback state descriptors for multiple UI components are stored in a client-side database. When transitioning playback of video content from a first UI component (such as a first media player) to a second UI component (such as a second media player), a user interface engine determines a current value of a playback state descriptor of the first UI component from the database. The user interface engine then sets the corresponding playback state descriptor of the second UI component to match the current value of the playback state descriptor of the first UI component and begins playback of the video content with the second UI using the current value of the playback state descriptor of the first UI component. As a result, the second UI component begins playback of the video content in a playback state that is the same as the playback state of the first UI component when playback of the video content is transitioned from the first UI component. For example, in one embodiment, the second UI component begins playback of the video content at the point in time at which the first UI stopped playback of the video content. In another embodiment, the second UI component begins playback of the video content at the same sound level employed by the first UI component when performing playback of the video content.

Advantageously, coordination of video playback is enabled between multiple UI components that can each perform video playback simultaneously. Consequently, multiple UI components are prevented from simultaneously performing playback of video content. Further, with only a single video being played back at a given time, downloading multiple video data streams is avoided when transitioning video playback from one UI component to another UI component.

### System Configuration

FIG. **1** illustrates a network infrastructure **100**, according to various embodiments. As shown, the network infrastructure **100** includes content servers **110**, control server **120**, and endpoint devices **115**, each of which are connected via a communications network **105**. Network infrastructure **100** is configured to distribute content to content servers **110**, and such content is then distributed on-demand to endpoint devices **115**.

Each endpoint device **115** communicates with one or more content servers **110** (also referred to as "caches" or "nodes") via the network **105** to download content, such as textual data, graphical data, audio data, video data, and other types of data. The downloadable content, also referred to herein as a "file," is then presented to a user of one or more endpoint devices **115**. In various embodiments, the endpoint devices **115** may include computer systems, set top boxes, mobile computer, smartphones, tablets, console and handheld video game systems, digital video recorders (DVRs), DVD players, connected digital TVs, dedicated media streaming devices, (e.g., the Roku® set-top box), and/or any other technically feasible computing platform that has network connectivity and is capable of presenting content, such as text, images, video, and/or audio content, to a user.

Each content server **110** may include a web-server, database, and server application **217** (described below) configured to communicate with the control server **120** to determine the location and availability of various files that are managed by the control server **120**. Each content server **110** may further communicate with cloud services **130** and one or more other content servers **110** in order to "fill" each content server **110** with copies of various files. In addition, content servers **110** may respond to requests for files received from endpoint devices **115**. The files may be distributed from the content server **110** or via a broader content distribution network. In some embodiments, the content servers **110** enable users to authenticate (e.g., using a username and password) in order to access files stored on the content servers **110**. Although only a single control server **120** is shown in FIG. **1**, in various embodiments multiple control servers **120** may be implemented to track and manage files.

In various embodiments, the cloud services **130** may include an online storage service (e.g., Amazon® Simple Storage Service, Google® Cloud Storage, etc.) in which a catalog of files, including thousands or millions of files, is stored and accessed in order to fill the content servers **110**.

Cloud services **130** also may provide compute or other processing services. Although only a single cloud services **130** is shown in FIG. **1**, in various embodiments multiple cloud services **130** may be implemented.

FIG. **2** is a more detailed illustration of content server **110** of FIG. **1**, according to various embodiments. As shown, the content server **110** includes, without limitation, a central processing unit (CPU) **204**, a system disk **206**, an input/output (I/O) devices interface **208**, a network interface **210**, an interconnect **212**, and a system memory **214**.

The CPU **204** is configured to retrieve and execute programming instructions, such as server application **217**, stored in the system memory **214**. Similarly, the CPU **204** is configured to store application data (e.g., software libraries) and retrieve application data from the system memory **214**. The interconnect **212** is configured to facilitate transmission of data, such as programming instructions and application data, between the CPU **204**, the system disk **206**, I/O devices interface **208**, the network interface **210**, and the system memory **214**. The I/O devices interface **208** is configured to receive input data from I/O devices **216** and transmit the input data to the CPU **204** via the interconnect **212**. For example, I/O devices **216** may include one or more buttons, a keyboard, a mouse, and/or other input devices. The I/O devices interface **208** is further configured to receive output data from the CPU **204** via the interconnect **212** and transmit the output data to the I/O devices **216**.

The system disk **206** may include one or more hard disk drives, solid state storage devices, or similar storage devices. The system disk **206** is configured to store non-volatile data such as files **218** (e.g., audio files, video files, subtitles, application files, software libraries, etc.). The files **218** can be retrieved by one or more endpoint devices **115** via the network **105**. In some embodiments, the network interface **210** is configured to operate in compliance with the Ethernet standard.

The system memory **214** includes a server application **217** configured to service requests for files **218** received from endpoint device **115** and other content servers **110**. When the server application **217** receives a request for a file **218**, the server application **217** retrieves the corresponding file **218** from the system disk **206** and transmits the file **218** to an endpoint device **115** or a content server **110** via the network **105**.

Files **218** include a plurality of digital visual content items, such as videos and still images. In addition, files **218** may include textual content associated with such digital visual content items, such as movie metadata. In some embodiments, a plurality of files **218** may be associated with a single video title. For example, in one such embodiment, for a specific video title that is available via content server **110** (such as a movie), there are multiple video streaming files associated with that specific video title, where each file is for a different resolution of the specific video title. Further, in such embodiments, the multiple video streaming files can further include multiple preview video files that are each configured for a different resolution of a preview video for the specific video title.

FIG. **3** is a more detailed illustration of control server **120** of FIG. **1**, according to various embodiments. As shown, the control server **120** includes, without limitation, a central processing unit (CPU) **304**, a system disk **306**, an input/output (I/O) devices interface **308**, a network interface **310**, an interconnect **312**, and a system memory **314**.

The CPU **304** is configured to retrieve and execute programming instructions, such as control application **317**, stored in the system memory **314**. Similarly, the CPU **304** is configured to store application data (e.g., software libraries) and retrieve application data from the system memory **314** and a database **318** stored in the system disk **306**. The interconnect **312** is configured to facilitate transmission of data between the CPU **304**, the system disk **306**, I/O devices interface **308**, the network interface **310**, and the system memory **314**. The I/O devices interface **308** is configured to transmit input data and output data between the I/O devices **316** and the CPU **304** via the interconnect **312**. The system disk **306** may include one or more hard disk drives, solid state storage devices, and the like. The system disk **206** (shown in FIG. **2**) is configured to store a database **318** of information associated with content servers **110**, cloud services **130**, and files **218**.

The system memory **314** includes a control application **317** configured to access information stored in the database **318** and process the information to determine the manner in which specific files **218** will be replicated across content servers **110** included in the network infrastructure **100**. The control application **317** may further be configured to receive and analyze performance characteristics associated with one or more of the content servers **110** and/or endpoint devices **115**.

FIG. **4** is a more detailed illustration of the endpoint device **115** of FIG. **1**, according to various embodiments. As shown, the endpoint device **115** may include, without limitation, a CPU **410**, a graphics subsystem **412**, an I/O device interface **414**, a mass storage unit **416**, a network interface **418**, an interconnect **422**, and a memory subsystem **430**.

In some embodiments, the CPU **410** is configured to retrieve and execute programming instructions stored in the memory subsystem **430**. Similarly, the CPU **410** is configured to store and retrieve application data (e.g., software libraries) residing in the memory subsystem **430**. The interconnect **422** is configured to facilitate transmission of data, such as programming instructions and application data, between the CPU **410**, graphics subsystem **412**, I/O devices interface **414**, mass storage **416**, network interface **418**, and memory subsystem **430**.

In some embodiments, the graphics subsystem **412** is configured to generate frames of video data and transmit the frames of video data to display device **450**. In some embodiments, the graphics subsystem **412** is also configured to generate a graphical user interface (GUI) and transmit the GUI to display device **450**. In some embodiments, the graphics subsystem **412** may be integrated into an integrated circuit, along with the CPU **410**. The display device **450** may comprise any technically feasible means for generating an image for display. For example, the display device **450** may be fabricated using liquid crystal display (LCD) technology, cathode-ray tube technology, and light-emitting diode (LED) display technology. An input/output (I/O) device interface **414** is configured to receive input data from user I/O devices **452** and transmit the input data to the CPU **410** via the interconnect **422**. For example, user I/O devices **452** may comprise one or more buttons or other pointing devices, such as the "up," "down," "left," "right," and "select" buttons on a television remote or video game console. The I/O device interface **414** also includes an audio output unit configured to generate an electrical audio output signal. User I/O devices **452** includes an audio speaker configured to generate an acoustic output in response to the electrical audio input signal. In alternative embodiments, the display device **450** may include the speaker. Examples of suitable devices known in the art that can display video frames and generate an acoustic output include televisions, smartphones, smartwatches, electronic tablets, and the like.

A mass storage unit **416**, such as a hard disk drive or flash memory storage drive, is configured to store non-volatile data. A network interface **418** is configured to transmit and receive packets of data via the network **105**. In some embodiments, the network interface **418** is configured to communicate using the well-known Ethernet standard. The network interface **418** is coupled to the CPU **410** via the interconnect **422**.

In some embodiments, the memory subsystem **430** includes programming instructions and application data that comprise an operating system **432**, an interface engine **434**, and a playback application **436**. The operating system **432** performs system management functions such as managing hardware devices including the network interface **418**, mass storage unit **416**, I/O device interface **414**, and graphics subsystem **412**. The operating system **432** also provides process and memory management models for the interface engine **434** and the playback application **436**. The interface engine **434**, such as a window and object metaphor, provides a mechanism for user interaction with endpoint device **115**, such as a graphical user interface (GUI). Persons skilled in the art will recognize the various operating systems and user interfaces that are well-known in the art and suitable for incorporation into the endpoint device **108**.

In some embodiments, the playback application **436** is configured to request and receive content from the content server **105** via the network interface **418**. Further, the playback application **436** is configured to interpret the content and present the content via display device **450** and/or user I/O devices **452**.

## User Interface with Embedded Video Players

FIG. **5** illustrates a graphical user interface (GUI) **500** generated by interface engine **434** of FIG. **4**, according to various embodiments. GUI **500** can be displayed on display device **450** of endpoint device **115**, particularly when endpoint device **115** is configured as a laptop computer, desktop computer, or other computing system. As shown, GUI **500** includes various display canvases **510** that are each configured to display information pertaining to a specific video content item, such as a particular video title. In some embodiments, each display canvas **510** includes an instance of a media player. Thus, each display canvas **510** is a fixed or moveable display region that can display a still image or a preview video for a specific video content item. Examples of video content items include movies, television series, documentaries, specific sporting events, and the like.

Display canvases **510** can include different configurations of display region. For example, display canvases **510** include a single large-presentation canvas, referred to herein as a "billboard canvas" **511**, and a plurality of array-sized canvases, referred to herein as "title card canvases" **512**, or a combination thereof. In various embodiments, billboard canvas **511** is larger than title card canvases **512** and is configured to automatically begin playing a preview video for a predetermined video content item, such as a newly released or otherwise featured video content item. In some embodiments, billboard canvas **511** is sized and positioned more prominently than any of title card canvases **512** to attract the attention of an on-demand user. For example, in some embodiments, billboard canvas **511** is initially or permanently positioned in a top region of GUI **500**. Additionally or alternatively, in some embodiments, a billboard canvas **511** can be disposed between arrays of title card canvases **512**. In such embodiments, as a user scrolls downward within GUI **500**, at least one billboard canvas **511** is

visible to the on-demand user. By contrast, title card canvases **512** are typically displayed in an array **530** and are generally configured to enable the on-demand user to visually scan the title card canvases **512** of a large number of available video content items. For example, in the embodiment illustrated in FIG. **5**, title card canvases **512** are arranged in multiple rows **531**, where each row **531** includes title card canvases **512** of a specific genre or category.

In addition to display canvases **510**, GUI **500** displays a cursor **501** and, in some embodiments, additional navigation tools, such as a side-bar menu and/or drop-down menus (not shown). In some embodiments, moving cursor **501** to an edge of GUI **500** causes scrolling of the contents of GUI **500** in an appropriate direction. For example, in such embodiments, positioning cursor **501** at or near a bottom edge **502** of GUI **500** can cause display canvases **510** to move upward, revealing additional display canvases **510**.

FIGS. **6A-6G** illustrate GUI **500** at various points in a process of displaying preview videos of available content items, according to various embodiments. In FIG. **6A**, an on-demand user has started playback application **436** and GUI **500** is displayed to an on-demand user. In the embodiment illustrated in FIGS. **6A-6G**, upon start-up of playback application **435**, cursor **501** is displayed in a neutral position, i.e., cursor **501** is not positioned within the boundaries of any of title card canvases **512**. As a result of GUI **500** being started up, a preview video for a featured video content item begins playing in billboard canvas **511**. Because cursor **501** is in a neutral position, no other display actions are implemented in GUI **500** and title card canvases **512** each display a static image associated with a different video content item that is currently available for selection.

In FIG. **6B**, the on-demand user has moved cursor **501** to a particular title card canvas **612** and hovers cursor **501** over title card canvas **612**. Title card canvas **612** is a specific title card canvas associated with a video content item of interest to the on-demand user. As shown, until cursor **501** has hovered over title card canvas **612** for a predetermined hover time interval (e.g., 1 second), the preview video for the featured video content item continues playing in billboard canvas **511** and a static image (not shown) associated with the video content item of interest continues to be displayed in title card canvas **612**.

In FIG. **6C**, the on-demand user has hovered cursor **501** over title card canvas **612** for the predetermined hover time interval. In response, title card canvas **612** appears to expand to larger video preview canvas **613**, which then begins playback of a preview video for the video content item of interest. For example, in some embodiments, a series of animated images are displayed at or in lieu of title card canvas **612**, causing the still image displayed by title card canvas **612** to appear to expand in size to the dimensions of video preview canvas **613**.

Simultaneously, or at approximately the same time, billboard canvas **511** halts or pauses playback of the preview video for the featured video content item. When billboard canvas **511** pauses playback of the preview video for the featured video content item, billboard canvas **511** displays a still image that includes the last frame of the preview video for the featured video content item. When billboard canvas **511** halts playback of the preview video, billboard canvas **511** displays a predetermined still image associated with the featured video content item. In either case, in FIG. **6C**, billboard canvas **511** is no longer performing playback of the preview video for the featured video content item. Therefore, according to the embodiment illustrated in FIGS. **6A-6G**, even though billboard canvas **511** is configured to automatically play a preview video without user input, when a user input indicates a request for a different canvas to playback a preview video (e.g., by hovering cursor **501** over title card canvas **612**), the instance of media player included in billboard canvas **511** halts or pauses playback. Thus, playback of a single video takes place at one time in GUI **500**, and the on-demand viewer is not confused or distracted by having multiple preview videos playing simultaneously. Further, the necessity for multiple streaming videos to be downloaded simultaneously to endpoint device **115** is avoided.

In alternative embodiments, in response to the on-demand user hovering cursor **501** over title card canvas **612**, title card canvas **612** does not appear to expand to larger video preview canvas **613**. Instead, in such embodiments, video preview canvas **613** has the same dimensions as title card canvas **612**, and begins playback of the preview video for the video content item of interest in the same portion of GUI **500** previously occupied by title card canvas **612**. Therefore, in such embodiments, video preview canvas **613** is instantiated in substantially the same location as title card canvas **612**. In yet other alternative embodiments, in response to the on-demand user hovering cursor **501** over title card canvas **612**, an instance of a media player already included in or associated with title card canvas **612** begins playback of the preview video for the video content item of interest.

In FIG. **6**D, the on-demand user has performed an input operation indicating a request for more detailed information regarding the video content item associated with title card canvas **612** or video preview canvas **613**. As shown, when the input operation is performed, the preview video for the featured video content item continues playing in video preview canvas **613**.

The input operation performed in FIG. **6**D can be any suitable input operation compatible with endpoint device **115** and any of the input devices associated therewith. For example, in some embodiments, the input operation is a left click with a computer mouse on a more details icon **601** that is displayed in video preview canvas **613**. Alternatively, in some embodiments, the input operation can be one or more of: hovering a portion of cursor **501** over more details icon **601**; selection of a more details option from a drop-down menu (not shown), such as a drop-down menu that is displayed in response to a right click with a computer mouse on a portion of video preview canvas **613**; depression of a hot key or combination of hot keys on a computer keyboard while cursor **501** hovers over a portion of more details icon **601** and/or video preview canvas **613**; and the like. In embodiments in which endpoint device **115** comprises a mobile computing device (such as a smartphone), the input operation can include any input operation compatible with a mobile device interface (such as a screen touch or swipe). In embodiments in which endpoint device **115** comprises a television (such as a smart TV), the input operation can include any input operation compatible with a television interface (such as a TV remote section or input).

In FIG. **6**E, in response to the input operation indicating the request for more detailed information, a feature-sized video preview canvas **614** is implemented in GUI **500** that continues playback of the preview video for the video content item of interest. For example, in some embodiments, feature-sized video preview canvas **614** is configured with similar dimensions, textual content, and/or control icons as billboard canvas **511**. Alternatively, in some embodiments, feature-sized video preview canvas **614** replaces, is overlayed on, and/or or otherwise obscures video preview canvas **613**.

Simultaneously, or at approximately the same time, video preview canvas **613** halts or pauses playback of the featured video content item. Therefore, according to the embodiment illustrated in FIGS. **6**A-**6**G, even though video preview canvas **613** is configured to playback the preview video for the video content item of interest, video preview canvas **613** halts or pauses playback of the preview video for the video content item in response to the input operation indicating the request for more detailed information. Thus, playback of a single video takes place at one time in GUI **500**.

In FIGS. **6**C and **6**D, a first instance of the preview video for the video content item of interest is played in a first instance of a media player associated with video preview canvas **613**, and in FIG. **6**E the first instance of the media player halts or pauses the first instance of the preview video in a first playback state. By contrast, in FIG. **6**E, a second instance of a media player associated with feature-sized video preview canvas **614** begins playback of a second instance of the preview video for the video content item. According to various embodiments, the second instance of the preview video begins playback in feature-sized video preview canvas **614** in the first playback state. That is, the second instance of the media player associated with feature-sized video preview canvas **614** begins playback of the second instance of the preview video in the same playback state as the first instance of the preview video when the first instance of the preview video is halted or paused in video preview canvas **613**.

In FIG. **6**F, the on-demand user has performed an input operation indicating an interest in the video content item associated with a different display canvas **510** than feature-sized video preview canvas **614**. In some embodiments, the input operation performed in FIG. **6**F can be any suitable input operation compatible with endpoint device **115** and any of the input devices associated therewith, including hovering cursor **501** over a particular display canvas **510**, selecting a particular display canvas **510** with a left click with a computer mouse, and the like. In the embodiment illustrated in FIG. **6**F, the on-demand user has hovered at least a portion of cursor **501** over a portion of billboard canvas **511**, which has been partially scrolled out of GUI **500**. Thus, the on-demand user has indicated an interest in the video content item associated with billboard canvas **511**. As shown, when the input operation is performed, the preview video for the video content item associated with feature-sized video preview canvas **614** continues to be played in feature-sized video preview canvas **614**.

In FIG. **6**G, in response to the input operation indicating an interest in the video content item associated with billboard canvas **511**, billboard canvas **511** is repositioned within GUI **500**. In addition, the preview video for the featured video content item associated with billboard canvas **511** begins playing in billboard canvas **511**. For example, in some embodiments, a media player associated with billboard canvas **511** begins playback of the preview video. According to some embodiments, playback of the preview video for the featured video content item begins in the same playback state as the playback state of the preview video when last paused or halted. Consequently, the on-demand user, having already seen a beginning portion of the preview video, is not forced to re-watch the beginning portion of the preview video. In addition, the audio state of the preview video, e.g., mute state or volume level, is the same as the audio state of the preview video most recently played in GUI **500**. In FIG. **6**G, the preview video most recently played in GUI **500** is the preview video for the video content item that was being played in feature-sized video preview canvas **614**.

Simultaneously, or at approximately the same time, feature-sized video preview canvas **614** halts or pauses playback of the featured video content item. Thus, playback of a single video takes place at one time in GUI **500**.

Generally, the media players implemented in GUI **500** are instantiated by interface engine **434** and include the media player associated with billboard canvas **511**, the media player associated with video preview canvas **613**, and the media player associated with feature-sized video preview canvas **614**, among others. Further, each such media player generally operates independently from the other media players implemented in GUI **500**. Consequently, coordination between such media players as described above can be problematic, since each media player is unaware of the playback state of other media players associated with GUI **500**. According to various embodiments, seamless transition is enabled between the playback of a preview video in one media player implemented in GUI **500** and another media player implemented in GUI **500**. Specifically, when an on-demand user requests playback of a preview video to transition from a first display canvas **510** to a second display canvas **510**, a media player associated with the second display canvas **510** performs playback of the preview video based on the playback state of the media player performing playback of the preview video in the first display canvas. One such embodiment is illustrated in FIG. **7**.

## Preview Playback Application

FIG. **7** is a block diagram of preview playback application **700**, configured to perform various embodiments. As shown, preview playback application **700** interacts with interface engine **434** and is implemented as an element of playback application **436** (shown in FIG. **4**). Alternatively, in some embodiments, preview playback application **700** is implemented as a client-side application that is separate from playback application **436** and runs in parallel with playback application **436** on endpoint device **115**. Preview playback application **700** includes a playback state database **720**, preview playback logic **730**, and a UI message log **740**.

Interface engine **434** is configured to instantiate or generate UI components of a GUI, such as canvases **510** of GUI **500**, and to destroy such UI components. Further, interface engine **434** is configured to interact with preview playback application **700**. More specifically, interface engine **434** is configured to read out data from playback state database **720**, for example to modify one or more characteristics of playback by a UI component. In addition, interface engine **434** is configured to send messages to UI message log **740**, for example in response to user inputs received by via a UI component.

Playback state database **720** stores values for playback state descriptors associated with the various display canvases included in a GUI generated by interface engine **434**. Specifically, for each display canvas or associated media player that is included in the GUI, playback state database **720** stores a settable value for one or more playback state descriptors. Thus, for GUI **500** of FIGS. **5**-**6**G, playback state database **720** stores playback state descriptor values for each display canvas **510** that currently is playing back or has played back at least a portion of a preview video. One embodiment of playback state database **720** is described below in conjunction with FIG. **8**.

FIG. **8** is a schematic illustration of playback state database **720**, according to an embodiment. Playback state database **720** includes a plurality of descriptor arrays **820**, each associated with a different display canvas generated by

interface engine **434**. As shown, each descriptor array **820** includes a display canvas identification (ID) **821**, a plurality of playback state descriptors **822**, and a plurality of values **823** that are each associated with a respective playback state descriptor **822**. In some embodiments, when playback of a preview video is started in a particular display canvas, a descriptor array **820** is generated for that particular display canvas, media player, or other UI component. In such embodiments, some descriptor arrays **820** can be associated with one type of UI component, such as a video preview canvas **613** in FIG. **6**C, other descriptor arrays **820** can be associated with another type of UI component, such as a billboard canvas **511** in FIG. **5**, and still other descriptor arrays **820** can be associated with yet another type of UI component, such as a feature-sized video preview canvas **614** in FIG. **6**E.

Display canvas ID **821** includes a value that uniquely identifies a particular UI component that is included in a GUI generated by interface engine **434**. In some embodiments, display canvas ID **821** includes one or more values indicating a specific type of UI component that is associated with descriptor array **820**. In some embodiments, display canvas ID **821** includes one or more values indicating a specific video content item that is being played by the UI component or has most recently been played by the UI component. In some embodiments, display canvas ID **821** may include one or more values representing other information or attributes of the UI component and/or of the specific video content item that is being played by the UI component, such as location of the UI component in the GUI generated by interface engine **434**, metadata associated with the specific video content item, etc.

Each playback state descriptor **822** in descriptor array **820** represents an attribute of the playback state of the UI component associated with that descriptor array **820**. Thus, by changing a value **823** associated with a particular playback state descriptor **822** in a particular descriptor array **820**, a characteristic of playing video content with the UI component associated with the particular descriptor array **820** changes. In the embodiment illustrated in FIG. **8**, playback state descriptors **822** include mute state (e.g., ON or OFF), play/pause state (e.g., Playing, Paused, Ended), sound volume level (e.g., 55%), and play time (e.g., 12.5 seconds). Other playback state descriptors **822** for other attributes of the playback state of the UI component associated with that descriptor array **820** can also be included in descriptor array **820**. In operation, playback of a first instance of a preview video is halted or paused in a first UI component while the first instance of the preview video is in a first playback state. Simultaneously, or at approximately the same time, playback of a second instance of the preview video in a second UI component can begin, where the second instance of the preview video begins in the first playback state. Consequently, playback of the preview video smoothly transitions from playback by the first UI component to playback by the second UI component.

In FIG. **8**, for purposes of description, values **823** of playback state descriptors **822** are generally depicted as non-numeric values. In practice, values **823** stored for some or all playback state descriptors can be numeric values stored in a suitable data structure, where a specific meaning is attributed to different numeric values.

In some embodiments, playback state database **720** also includes a general descriptor array **850**. In such embodiments, general descriptor array **850** includes one or more general playback state descriptors **852** and a plurality of values **853** that are each associated with a respective general playback state descriptor **822**. In such embodiments, each general playback state descriptor **852** represents a general attribute of the playback state of any of the UI components currently included in the GUI. For example, in the embodiment illustrated in FIG. **8**, general descriptor array **850** includes a video mute state and a video sound level. In embodiments in which playback state database **720** includes general descriptor array **850**, the current values of general playback state descriptors **852** are employed by whatever UI component is currently performing playback of a preview video.

Returning to FIG. **7**, preview playback logic **730** is configured to implement a seamless transition between the playback of a preview video in one media player (or other UI component) implemented in a GUI and another media player (or other UI component) implemented in the same GUI. Thus, in some embodiments, preview playback logic **730** receives messages, for example via UI message log **740**, from UI components that receive user inputs. Preview playback logic **730** then updates playback state database **720** accordingly.

For example, in an embodiment, when a cursor is hovered over a particular display canvas included in a GUI, that particular display canvas sends a message to UI message log **740**. In the embodiment, the message sent to UI message log **740** is an input indicating that a media player associated with or included in the particular display canvas is requested to play. In response to such an input, preview playback logic **730** sets the value **823** of an appropriate playback state descriptor **822**, such as the playback state descriptor **822** that represents the play/pause state of that particular display canvas. The playback state descriptor **822** that is set is included in the descriptor array **820** for that particular display canvas.

In another example, in another embodiment, when a cursor is moved off of a particular display canvas included in a GUI, that particular display canvas sends a message to UI message log **740**. In the embodiment, the message sent to UI message log **740** is an input indicating that a media player associated with or included in the display canvas is requested to stop playback of the preview video currently being played in that particular display canvas. In response, preview playback logic **730** sets all of the current values **823** included in the descriptor array **820** for that particular display canvas to reflect the current playback state of that particular display canvas. In this way, the playback state of that particular display canvas persists when the preview video that was being played in that particular display canvas begins to be played back in a later instance of a display canvas.

UI message log **740** receives and stores messages received from interface engine **434**. In some embodiments, such messages originate from interface engine **434**. Alternatively or additionally, in some embodiments, such messages originate from UI components included in a GUI generated by interface engine **434**.

## Implementation of Preview Playback Application

FIG. **9** sets forth a flowchart of method steps for updating a playback state database, according to various embodiments. Although the method steps are described with respect to the systems of FIGS. **1-8**, persons skilled in the art will understand that any system configured to perform the method steps, in any order, falls within the scope of the present disclosure.

As shown, a method **900** begins at step **901**, in which preview playback application **700** receives a message from interface engine **434**. In some embodiments, preview playback application **700** receives the message by determining that UI message log **740** has been updated by interface engine **434**.

In step **902**, based on the message received in step **901**, preview playback application **700** determines one or more playback state descriptors to be set. For example, when preview playback application **700** receives a message indicating that a value for a particular playback state descriptor **822** for a particular display canvas should be changed (e.g. mute state changed to ON), preview playback application **700** determines that the descriptor array **820** associated with that particular display canvas and that particular playback state descriptor **822** is to be set. In another example, when preview playback application **700** receives a message indicating that a media player associated with or included in a display canvas is requested to stop playback of the preview video currently being played in that particular display canvas, preview playback application **700** determines that all playback state descriptors **822** in the descriptor array **820** associated with the display canvas that has been requested to stop playback are to be set.

In some embodiments, in step **902** preview playback application **700** determines that one or more playback state descriptors **822** are to be changed in multiple descriptor arrays **820**. For example, in one such embodiment, in step **901** preview playback application **700** receives a message indicating that a value **823** should be changed for a particular playback state descriptor **822** that applies to any instance of the video content currently being played (e.g., current play time). In the embodiment, preview playback application **700** determines that in each descriptor array **820** associated with the video content currently being played, the value **823** for the particular playback state descriptor **822** is to be set. Thus, when activated by a user, any display canvas that is associated with the video content currently being played can start at the current play time stored for that particular video content.

In some embodiments, in step **902** preview playback application **700** determines which descriptor arrays **820** included in playback state database **720** are associated with the video content currently being played. In such embodiments, preview playback application **700** makes the determination based on the display canvas ID **821** of each descriptor array **820**. In alternative embodiments, in step **902** preview playback application **700** makes the determination via a lookup table or other data structure.

In step **903**, preview playback application **700** sets the playback state descriptors **822** determined in step **902**. For example, when preview playback application **700** has determined in step **902** that the descriptor array **820** associated with a particular display canvas and a particular playback state descriptor **822** is to be set, preview playback application **700** sets the value **823** of that particular playback state descriptor **822** to match an appropriate value (e.g. mute state set to ON). Similarly, when preview playback application **700** determines that all playback state descriptors **822** in a particular descriptor array **820** are to be set, preview playback application **700** sets the values **823** of all playback state descriptors **822** in that particular descriptor array **820** to match values indicating the current playback state of the display canvas associated with that particular descriptor array **820**. For example, all playback state descriptors **822** in a particular descriptor array **820** may be set when the display canvas associated therewith has been requested to stop playback. Thus, the attributes of the display canvas that has been requested to stop playback are captured in an associated descriptor array **820** for subsequent application to another display canvas that is instantiated to display the same video content.

FIG. **10** sets forth a flowchart of method steps for transitioning playback of video content from a first UI component to a second UI component, according to various embodiments. Although the method steps are described with respect to the systems of FIGS. **1-9**, persons skilled in the art will understand that any system configured to perform the method steps, in any order, falls within the scope of the present disclosure.

As shown, a method **1000** begins at step **1001**, in which interface engine **434** generates or otherwise instantiates GUI **500**. For example, in some embodiments, interface engine **434** opens GUI **500** in response to playback application **436** being executed on endpoint device **115**.

In step **1002**, interface engine **434** determines whether an input is received by a UI component of GUI **500** indicating that playback of a preview video for a particular video content item is requested. In some embodiments, such an input is received via an input operation, such as hovering a cursor over a particular display canvas of GUI **500**, or selecting a more details icon **601** of GUI **500**. If no, method **100** returns to step **1002**; if yes, method **1000** proceeds to step **1003**.

In step **1003**, interface engine **434** determines whether playback of any other preview video has been performed by GUI **500**. If no, method **1000** proceeds to step **1021**; if yes, method **1000** proceeds to step **1004**.

In step **1004**, interface engine **434** determines whether playback of the preview video for the particular video content item indicated in step **1002** has been performed by a UI component of GUI **500**. If yes, method **1000** proceeds to step **1031**; if no, method **100** proceeds to step **1005**.

In step **1005**, interface engine **434** performs a lookup of values **853** for the general playback state descriptors **852** for GUI **500**, if applicable. For example, in some embodiments, interface engine **434** performs a lookup of audio state descriptors (e.g., preview video mute state, preview video sound volume level, etc.).

In step **1006**, if applicable, interface engine **434** generating a media player or other UI component for performing playback of the preview video for the particular video content item requested in step **1002**. In some instances, the UI component for performing playback of the preview video already exists. For example, when a user hovers cursor **501** over a title card canvas **612** that has previously displayed at least a portion of the preview video, interface engine **434** does not create another media player or other UI component.

In step **1007**, interface engine **434** modifies one or more characteristics of playback by the UI component based on values **853** for the general playback state descriptors **852** looked up in step **1005** and/or values **823** for the playback state descriptors **822** looked up in step **1031**. For example, the mute state, sound volume level, and/or play time of the UI component are set to match values **823** and **853**. As a result, the UI component generated or selected in step **1006** is configured to perform video playback in a specified playback state, such as a playback state of a display canvas that is most recently associated with the video content to be played by the UI component generated or selected in step **1006**.

In step **1008**, when applicable, interface engine **434** causes a UI component that is currently performing playback of other video content to pause or halt playback of the

other video content. For example, prior to step **1008**, such a UI component may be playing another preview video for a different video content item. Alternatively, in some embodiments, the UI component currently performing playback of the other video content sends a message to UI message log **740** indicating that the UI component is requested to be stopped. In such embodiments, preview playback logic **730** updates playback state database **720** as described above in conjunction with method **900** of FIG. **9**. Further, in some embodiments, preview playback logic **730** causes downloading of video data associated with the other video content to stop or notifies playback application **436** to cause downloading of video data associated with the other video content to stop.

In step **1009**, interface engine **434** begins playback of the preview video requested in step **1002**. When applicable, one or more characteristics of playback by the UI component beginning playback of the preview video have been modified based on values **853** for general playback state descriptors **852** and/or values **823** for the playback state descriptors **822**. Consequently, when the preview video requested in step **1002** has been performed previously by a UI component of GUI **500**, playback of the preview video begins at the point the previous playback of the preview video ended. Further, in some embodiments, the audio state of the UI component beginning playback of the preview video matches that of the UI component that was previously performing playback in GUI **500**. Once playback of the preview video begins, method **1000** returns to step **1002**.

Step **1021** is performed in response to interface engine **434** determining that playback of no other preview video has been performed by GUI **500**. For example, step **1021** is commonly performed shortly after GUI **500** is first opened. In step **1021**, interface engine **434** creates a media player or other UI component for performing playback of the preview video for the particular video content item requested in step **1002**. In step **1022**, interface engine **434** modifies one or more characteristics of playback by the UI component created in step **1021** based on default values for values **853** for general playback state descriptors **852** and/or values **823** for the playback state descriptors **822**. Method **1000** then proceeds to step **1008**, where playback of the preview video requested in step **1002** begins.

Step **1031** is performed in response to interface engine **434** determining that playback of the preview video indicated in step **1002** has been performed previously by a UI component of GUI **500**. In step **1031**, interface engine **434** performs a lookup of one or more values **823** for the playback state descriptors **822** of the UI component that has most recently performed playback of the preview video indicated in step **1002**. For example, in some embodiments, interface engine **434** performs a lookup of a value **823** for the play time of the UI component that has most recently performed playback of the preview video indicated in step **1002**.

In sum, various embodiments set forth systems and techniques for transitioning playback of video content from a first UI component to a second UI component in a video streaming user interface. In the embodiments, current values of playback state descriptors for multiple UI components are stored in a client-side database. When transitioning playback of video content from the first UI component to the second UI component, a user interface engine determines a current value of a playback state descriptor of the first UI component from the database. The user interface engine then sets the corresponding playback state descriptor of the second UI component to match the current value of the playback state descriptor of the first UI component and begins playback of the video content with the second UI component using the current value of the playback state descriptor of the first UI component.

At least one technological improvement of the disclosed embodiments is that coordination of video playback is enabled between multiple UI components that can each perform video playback simultaneously. Consequently, downloading multiple video data streams when transitioning video playback from one UI component to another UI component can be avoided. In addition, multiple UI components are prevented from simultaneously performing playback of video content.

1. In some embodiments, a method comprises, based on an input to transition playback of a video content item from a first media player that is instantiated in a user interface to a second media player that is instantiated in the user interface, determining a current value of a first state descriptor associated with the first media player, setting a value of a second state descriptor associated with the second media player to match the current value of the first state descriptor, and, after setting the value of the second state descriptor, causing the second media player to begin playback of the video content item, where the second media player begins playing the video content item based on the value of the second state descriptor.

2. The method of clause 1, further comprising, after setting the value of the second state descriptor to match the current value of the first state descriptor, causing the first media player to stop playing the video content item.

3. The method of clause 1 or 2, wherein the first playback state descriptor is associated with a first attribute of a current playback state of the first media player and the second playback state descriptor is associated with a second attribute of a current playback state of the second media player.

4. The method of any of clauses 1-3, wherein the first attribute and the second attribute correspond to a same characteristic of playback of a video content item.

5. The method of any of clauses 1-4, wherein the first attribute of the first media player comprises one of a mute setting, a volume level, and a current play time associated with playback of the video content item on the first media player or the second attribute of the second media player comprises one of a mute setting, a volume level, and a current play time associated with playback of the video content item on the second media player.

6. The method of any of clauses 1-5, wherein the first attribute is included in a first array of attributes that are each associated with the current playback state of the first media player and the second attribute is included in a second array of attributes that are each associated with the current playback state of the second media player.

7. The method of any of clauses 1-6, wherein the input to transition playback of the video content item comprises a user input.

8. The method of any of clauses 1-7, wherein the user input is received via the user interface.

9. The method of any of clauses 1-8, wherein the input to transition playback of the video content item comprises a predetermined value for a third state descriptor associated with the second media player.

10. The method of any of clauses 1-9, further comprising, prior to determining the current value of the first state descriptor associated with the first media player, determining that a current value for the third state descriptor equals the predetermined value.

11. The method of any of clauses 1-10, wherein the first playback state descriptor is associated with an attribute of a current playback state of the video content item and the second playback state descriptor is associated with the attribute of the current playback state of the video of content item.

12. The method of any of clauses 1-11, further comprising instantiating the second media player concurrently with the first media player.

13. The method of any of clauses 1-12, further comprising causing at least a portion of the first media player and at least at least a portion of the second media player to be displayed concurrently by a same display device.

14. The method of any of clauses 1-13, further comprising generating the second media player based on the input to transition playback of the video content item from the first media player to the second media player.

15. In some embodiments, a non-transitory computer readable medium stores instructions that, when executed by a processor, cause the processor to perform the steps of: based on an input to transition playback of a video content item from a first media player that is instantiated in a user interface to a second media player that is instantiated in the user interface, determining a current value of a first state descriptor associated with the first media player, setting a value of a second state descriptor associated with the second media player to match the current value of the first state descriptor, and, after setting the value of the second state descriptor, causing the second media player to begin playback of the video content item, wherein the second media player begins playing the video content item based on the value of the second state descriptor.

16. The non-transitory computer readable medium of clause 15, further comprising, after setting the value of the second state descriptor to match the current value of the first state descriptor, causing the first media player to stop playing the video content item.

17. The non-transitory computer readable medium of clause 15 or 16, wherein the first playback state descriptor is associated with a first attribute of a current playback state of the first media player and the second playback state descriptor is associated with a second attribute of a current playback state of the second media player.

18. The non-transitory computer readable medium of any of clauses 15-17, wherein the first attribute and the second attribute correspond to a same characteristic of playback of a video content item.

19. In some embodiments, a system comprises a memory that stores instructions, and a processor that is coupled to the memory and is configured to perform the steps of, upon executing the instructions: based on an input to transition playback of a video content item from a first media player that is instantiated in a user interface to a second media player that is instantiated in the user interface, determining a current value of a first state descriptor associated with the first media player, setting a value of a second state descriptor associated with the second media player to match the current value of the first state descriptor, and after setting the value of the second state descriptor, causing the second media player to begin playback of the video content item, wherein the second media player begins playing the video content item based on the value of the second state descriptor.

20. The system of clause 19, wherein the first playback state descriptor is associated with a first attribute of a current playback state of the first media player and the second playback state descriptor is associated with a second attribute of a current playback state of the second media player.

Any and all combinations of any of the claim elements recited in any of the claims and/or any elements described in this application, in any fashion, fall within the contemplated scope of the present disclosure and protection.

The descriptions of the various embodiments have been presented for purposes of illustration, but are not intended to be exhaustive or limited to the embodiments disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art without departing from the scope and spirit of the described embodiments.

Aspects of the present embodiments may be embodied as a system, method or computer program product. Accordingly, aspects of the present disclosure may take the form of an entirely hardware embodiment, an entirely software embodiment (including firmware, resident software, micro-code, etc.) or an embodiment combining software and hardware aspects that may all generally be referred to herein as a "module" or "system." In addition, any hardware and/or software technique, process, function, component, engine, module, or system described in the present disclosure may be implemented as a circuit or set of circuits. Furthermore, aspects of the present disclosure may take the form of a computer program product embodied in one or more computer readable medium(s) having computer readable program code embodied thereon.

Any combination of one or more computer readable medium(s) may be utilized. The computer readable medium may be a computer readable signal medium or a computer readable storage medium. A computer readable storage medium may be, for example, but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, or device, or any suitable combination of the foregoing. More specific examples (a non-exhaustive list) of the computer readable storage medium would include the following: an electrical connection having one or more wires, a portable computer diskette, a hard disk, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), an optical fiber, a portable compact disc read-only memory (CD-ROM), an optical storage device, a magnetic storage device, or any suitable combination of the foregoing. In the context of this document, a computer readable storage medium may be any tangible medium that can contain, or store a program for use by or in connection with an instruction execution system, apparatus, or device.

Aspects of the present disclosure are described above with reference to flowchart illustrations and/or block diagrams of methods, apparatus (systems) and computer program products according to embodiments of the disclosure. It will be understood that each block of the flowchart illustrations and/or block diagrams, and combinations of blocks in the flowchart illustrations and/or block diagrams, can be implemented by computer program instructions. These computer program instructions may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine. The instructions, when executed via the processor of the computer or other programmable data processing apparatus, enable the implementation of the functions/acts specified in the flowchart and/or block diagram block or blocks. Such processors may be, without limitation, general purpose processors, special-purpose processors, application-specific processors, or field-programmable gate arrays.

The flowchart and block diagrams in the figures illustrate the architecture, functionality, and operation of possible implementations of systems, methods and computer program products according to various embodiments of the present disclosure. In this regard, each block in the flowchart or block diagrams may represent a module, segment, or portion of code, which comprises one or more executable instructions for implementing the specified logical function (s). It should also be noted that, in some alternative implementations, the functions noted in the block may occur out of the order noted in the figures. For example, two blocks shown in succession may, in fact, be executed substantially concurrently, or the blocks may sometimes be executed in the reverse order, depending upon the functionality involved. It will also be noted that each block of the block diagrams and/or flowchart illustration, and combinations of blocks in the block diagrams and/or flowchart illustration, can be implemented by special purpose hardware-based systems that perform the specified functions or acts, or combinations of special purpose hardware and computer instructions.

While the preceding is directed to embodiments of the present disclosure, other and further embodiments of the disclosure may be devised without departing from the basic scope thereof, and the scope thereof is determined by the claims that follow.

What is claimed is:

**1**. A method, comprising:

based on user input to transition between playback of first video content in a first media player included in a plurality of media players concurrently displayed in a user interface and playback of second video content in a second media player included in the plurality of media players, determining a current value of a first state descriptor associated with the first media player;

setting a value of a second state descriptor associated with the second media player to match the current value of the first state descriptor; and

after setting the value of the second state descriptor, causing the second media player to begin the playback of the second video content,

wherein the second media player begins the playback of the second video content based on the value of the second state descriptor.

**2**. The method of claim **1**, further comprising, after setting the value of the second state descriptor to match the current value of the first state descriptor, causing the first media player to stop playing the first video content.

**3**. The method of claim **1**, wherein the first playback state descriptor is associated with a first attribute of a current playback state of the first media player and the second playback state descriptor is associated with a second attribute of a current playback state of the second media player.

**4**. The method of claim **3**, wherein the first attribute and the second attribute correspond to a same characteristic of playback of a video content item.

**5**. The method of claim **3**, wherein the first attribute of the first media player comprises one of a mute setting, a volume level, and a current play time associated with playback of the first video content on the first media player or the second attribute of the second media player comprises one of a mute setting, a volume level, and a current play time associated with playback of the second video content on the second media player.

**6**. The method of claim **3**, wherein the first attribute is included in a first array of attributes that are each associated with the current playback state of the first media player and the second attribute is included in a second array of attributes that are each associated with the current playback state of the second media player.

**7**. The method of claim **1**, wherein the user input is received via the user interface.

**8**. The method of claim **1**, wherein determining the current value of the first state descriptor associated with the first media player is further based on a predetermined value for a third state descriptor associated with the second media player.

**9**. The method of claim **8**, further comprising, prior to determining the current value of the first state descriptor associated with the first media player, determining that a current value for the third state descriptor equals the predetermined value.

**10**. The method of claim **1**, wherein the first playback state descriptor is associated with an attribute of a current playback state of the first video content and the second playback state descriptor is associated with the attribute of the current playback state of the second video content.

**11**. The method of claim **1**, wherein the first state descriptor is associated with a volume level of the first media player and the second state descriptor is associated with a volume level of the second media player.

**12**. The method of claim **1**, further comprising causing at least a portion of the first media player and at least at least a portion of the second media player to be displayed concurrently by a same display device.

**13**. A non-transitory computer readable medium storing instructions that, when executed by a processor, cause the processor to perform the steps of:

based on user input to transition between playback of first video content in a first media player included in a plurality of media players concurrently displayed in a user interface and playback of second video content in a second media player included in the plurality of media players determining a current value of a first state descriptor associated with the first media player;

setting a value of a second state descriptor associated with the second media player to match the current value of the first state descriptor; and

after setting the value of the second state descriptor, causing the second media player to begin the playback of the second video content,

wherein the second media player begins the playback of the second video content based on the value of the second state descriptor.

**14**. The non-transitory computer readable medium of claim **13**, further comprising, after setting the value of the second state descriptor to match the current value of the first state descriptor, causing the first media player to stop playing the first video content.

**15**. The non-transitory computer readable medium of claim **13**, wherein the first playback state descriptor is associated with a first attribute of a current playback state of the first media player and the second playback state descriptor is associated with a second attribute of a current playback state of the second media player.

**16**. The non-transitory computer readable medium of claim **15**, wherein the first attribute and the second attribute correspond to a same characteristic of playback of a video content item.

**17**. The non-transitory computer readable medium of claim **13**, wherein the first state descriptor is associated with a volume level of the first media player and the second state descriptor is associated with a volume level of the second media player.

**18**. A system, comprising:

a memory that stores instructions; and

a processor that is coupled to the memory and is configured to perform the steps of, upon executing the instructions:

based on user input to transition between playback of first video content in a first media player included in a plurality of media player concurrently displayed in a user interface and playback of second video content in a second media player included in the plurality of media players, determining a current value of a first state descriptor associated with the first media player;

setting a value of a second state descriptor associated with the second media player to match the current value of the first state descriptor; and

after setting the value of the second state descriptor, causing the second media player to begin the playback of the second video content,

wherein the second media player begins the playback of the second video content based on the value of the second state descriptor.

**19**. The system of claim **18**, wherein the first playback state descriptor is associated with a first attribute of a current playback state of the first media player and the second playback state descriptor is associated with a second attribute of a current playback state of the second media player.

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